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Emissions of Producing Oil and Gas Wells

Radian Corp, Austin, Tex

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EMISSIONS OF PRODUCING OIL AND GAS WELLS

NOVEMBER 1977
FINAL REPORT

ENVIRONMENTAL PROTECTION AGENCY
ROCKY MOUNTAIN PRAIRIE REGION
DENVER, COLORADO 80239

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16. ABSTRACT

This report describes the methods and results of a program to assess the emissions of oil and gas wells. The impact of the emissions was determined through a combination of source testing for fugitive emissions, ambient air quality monitoring, and meteorological monitoring. Fugitive emissions were detected that ranged from minute leaks to jet-type leaks. Ambient monitoring measured periodically high levels of hydrogen sulfide and hydrocarbons at the oil field. Emission rates and emission factors were determined for each of the wells sampled.

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EMISSIONS OF
PRODUCING OIL AND GAS WELLS

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Submitted to:

Terry Thoem
Environmental Protection Agency
Region VIII
Denver, Colorado

Contract No. 68-01-3700

Prepared by:

Radian Staff

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This report describes the methods and results of a program to assess the emissions of oil and gas wells. The impact of the emissions was determined through a combination of source testing for fugitive emissions, ambient air quality monitoring, and meteorological monitoring. Fugitive emissions were detected that ranged from minute leaks to jet-type leaks. Ambient monitoring measured periodically high levels of hydrogen sulfide and hydrocarbons at the oil field. Emission rates and emission factors were determined for each of the wells sampled.

This report has been reviewed by EPA, Region VIII, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

PREFACE

This document describes a study of the emissions from an oil and gas field and was prepared under EPA Contract No. 68-01-3700.

The study was conducted under the direction of Mr. Terry L. Thoem, Project Officer, Environmental Protection Agency, Region VIII, Denver, Colorado.

Acknowledgement is given to Chevron Oil Company whose full cooperation greatly facilitated the field work. Mr. William Jackson and Mr. Roy Chambers of Chevron contributed significantly to the program in providing advice and assistance.

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I. INTRODUCTION

This report describes the methods and results of a program to assess the air quality impacts of producing oil and gas wells through a combination of source testing, ambient air quality monitoring, and meteorological monitoring.

Pollutants emitted into the ambient air are either controlled emissions or fugitive leaks. The number of controlled emissions in an oil or gas field is not extensive and the primary sources of emissions are leaks from which fugitive emissions are released without control of flow or direction. Many potential sites for fugitive emissions exist in the vicinity of an oil or gas well. Types of installations, quality of materials, production methods, and quality of maintenance are important factors in determining the rate of fugitive emissions, and variations in these factors can cause emissions to be vastly different from one well to another.

Since undetected leaks exist in an oil and gas field and their impact is unknown, this program was undertaken to determine the magnitude of the problems and the difficulties associated with conducting such a study. Fugitive emissions cannot be measured by standard sampling and analytical techniques; yet, the development of reliable measurement procedures is an essential prerequisite to the development of strategies for the control of fugitive emissions. Therefore, two of the primary objectives of this study were to develop the techniques for making valid impact assessments of producing oil and gas wells and identify potential problems in making such measurements and assessments.

Two techniques were used in conjunction in this study. One method was to sample the emission of a unit by bagging techniques at the point at which the fugitive emission is leaking. After detecting and observing both gaseous and liquid leaks, the leak rates were measured or approximated, and the emitted species analyzed both qualitatively and quantitatively. The other method was the monitoring of the air quality in the vicinity of the work unit after the emissions had leaked into the atmosphere.

Section II of this report describes the oil and gas field studied in this program and the sites chosen for evaluation. Section III describes the air quality monitoring equipment and the fugitive-emission sampling techniques. Section IV presents the sampling and monitoring results. Section V discusses these results, and a summary is provided in Section VI. The appendices include meteorological summaries and ambient air quality data from other nearby monitoring networks.

II. SITE DESCRIPTION

The sampling and monitoring program was conducted at Rangely Weber Sand Unit in Rangely, Colorado. Criteria for selecting this field as the test site were location and accessibility, availability, general operating procedures, type of field, size, and stage of development.

The Rangely oil field is located in an environment in northwestern Colorado where there are no significant man-made sources of emissions. The location of the site with respect to the federal oil shale tracts is shown in Figure II-1. The relative locations of these sites are shown because each federal tract has active ambient air monitoring stations. These monitoring stations are a source of background data on the existing air quality surrounding the oil field.

The Rangely field is an oil and gas field employing water injection techniques to enhance oil recovery. A map of the field is shown in Figure II-2. The present production rate is:

Oil - 59,000 B/D
Water - 227,000 B/D
Gas - 6,000 MCF/D

The Rangely field produces approximately 50 percent of the oil in Colorado and was ranked nineteenth in production in 1975 and nineteenth in reserves in 1974 in the United States. Table II-1 compares the production of the Rangely field to the productions of Colorado, EPA Region VIII, and the United States. The field uses both submersible electric pumps and the more familiar rod pumps, shown in Figures II-3 and II-4. Gas engine driven rod pumps are being phased out as the field becomes fully electrified.

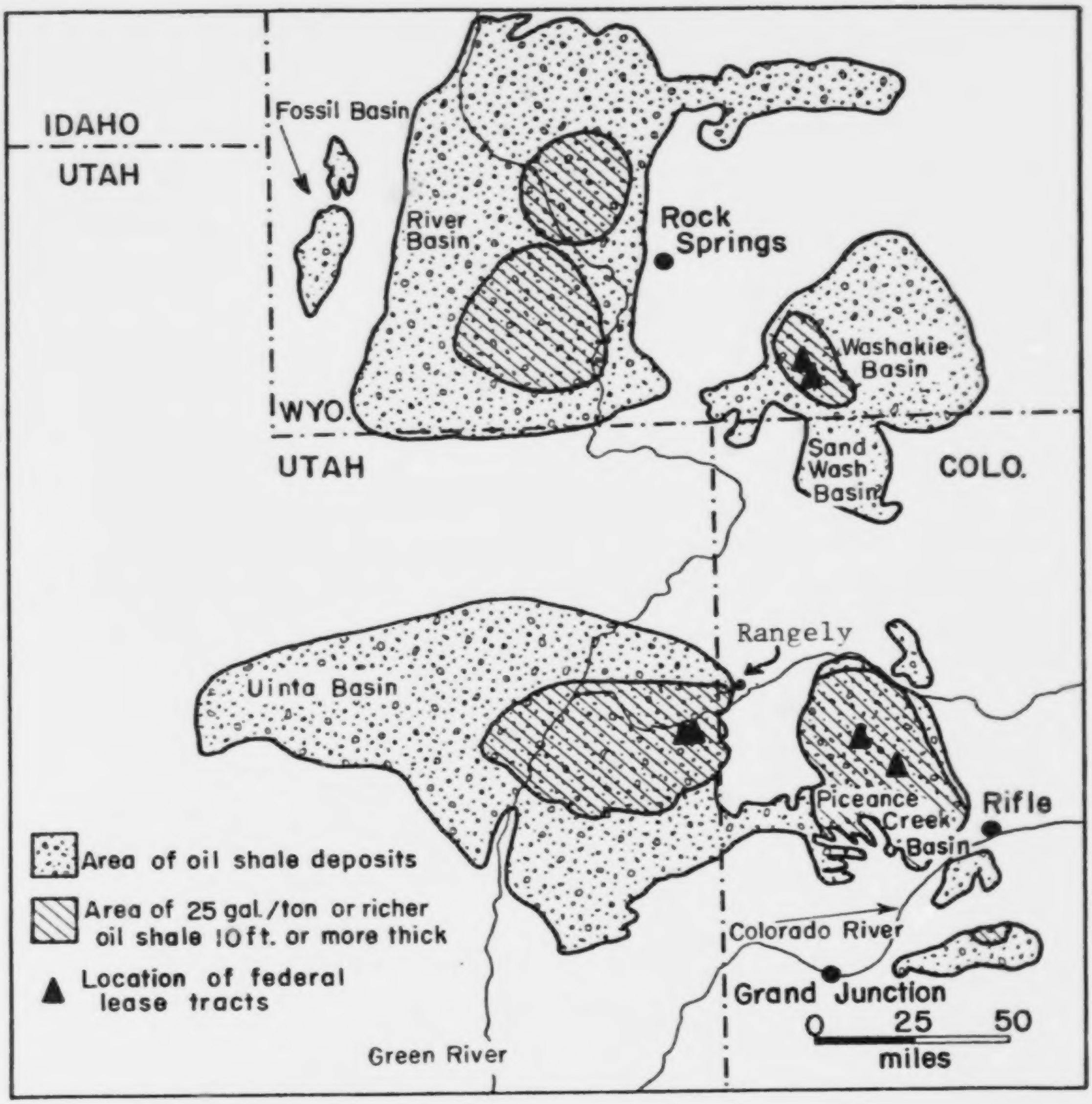

IDAHO
UTAH
Fossil Basin
River Basin
Rock Springs
Washakie Basin
WYO.
UTAH
Sand Wash Basin
COLO.
Rangely
Uinta Basin
Piceance Creek Basin
Rifle
Area of oil shale deposits
Area of 25 gal./ton or richer oil shale 10 ft. or more thick
Location of federal lease tracts
Colorado River
Grand Junction
0 25 50
miles
Green River

FIGURE II-1. LOCATION OF RANGELY WEBER SAND FIELD

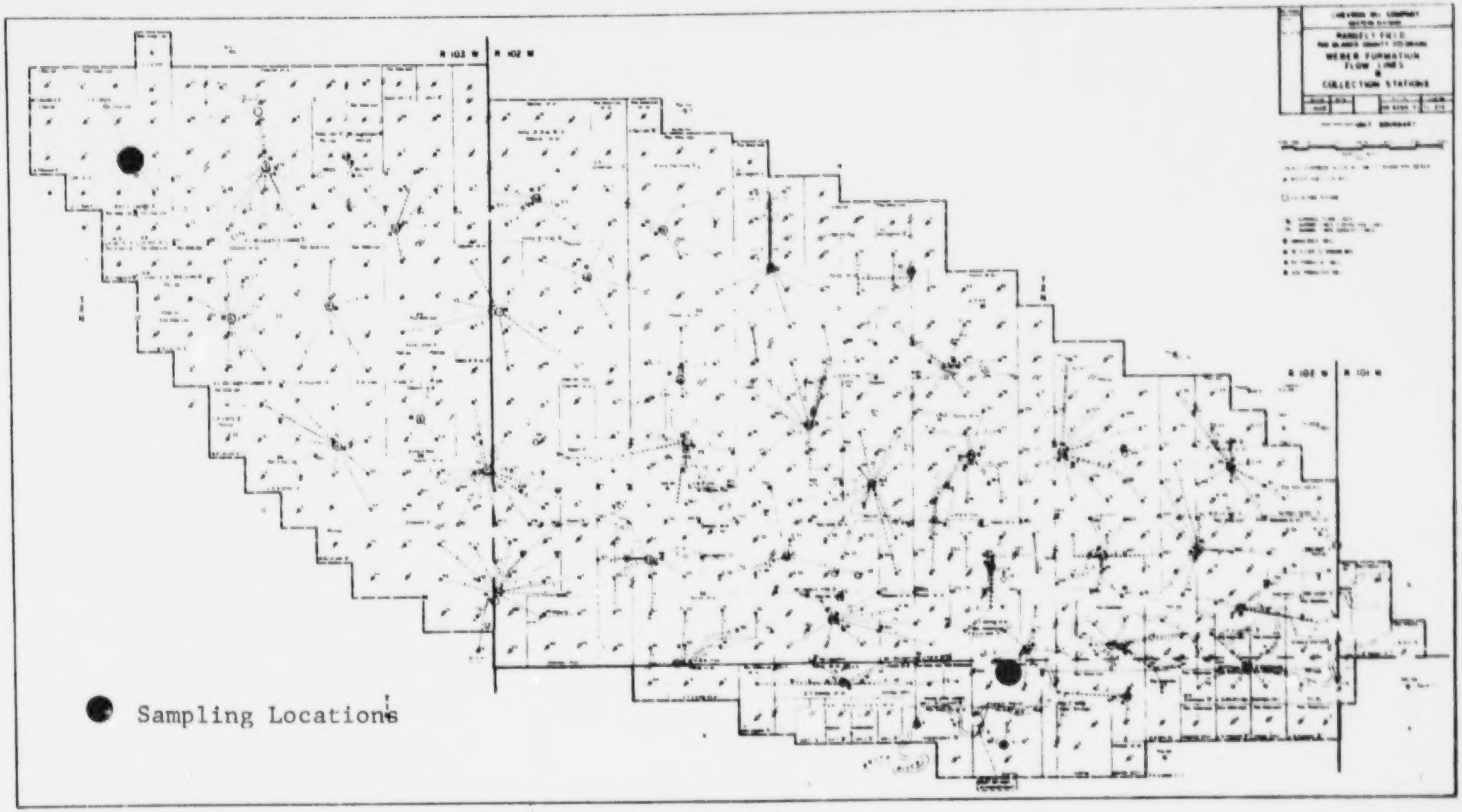

CHEVRON OIL COMPANY
RANGELY FIELD
RIO BLANCO COUNTY COLORADO
WEBER FORMATION
FLOW LINES
&
COLLECTION STATIONS
R 103 W
R 102 W
R 102 W
R 101 W
● Sampling Locations

FIGURE II-2
RANGELY FIELD

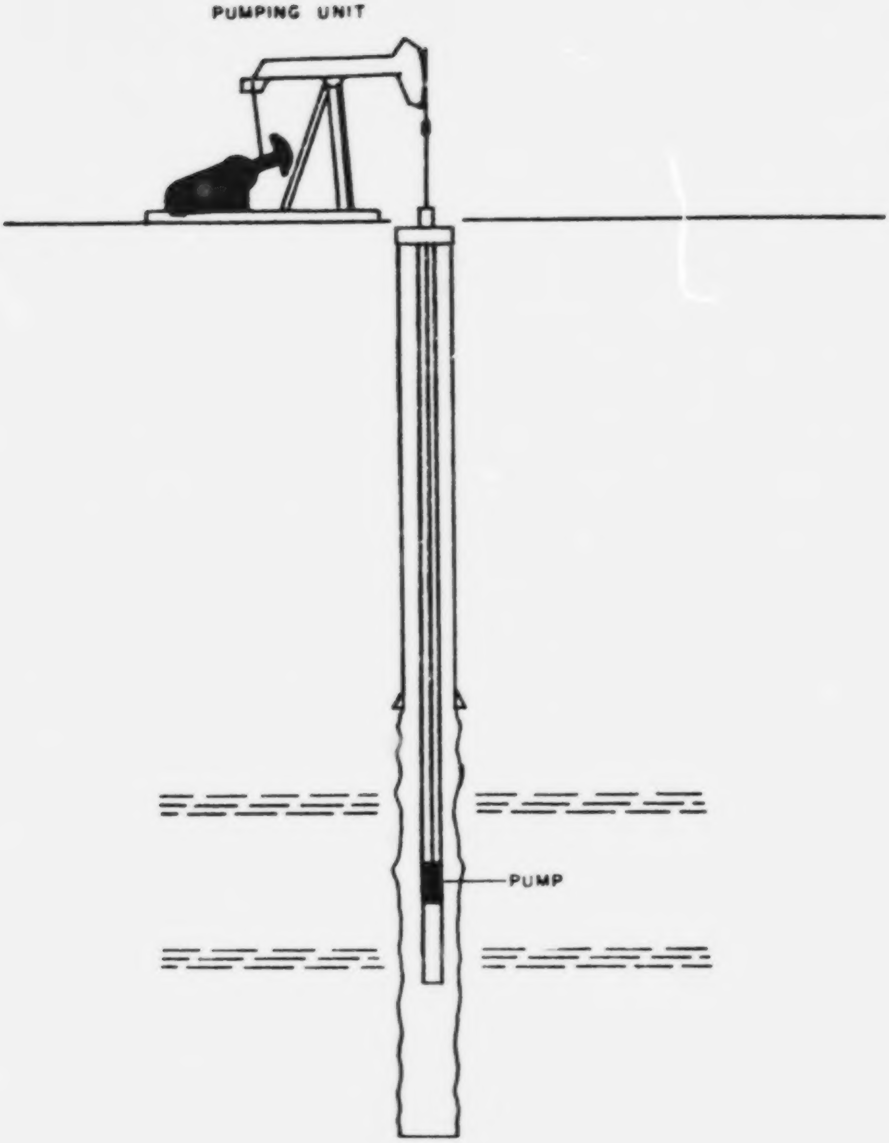

PUMPING UNIT
PUMP

FIGURE II-3. ROD PUMP

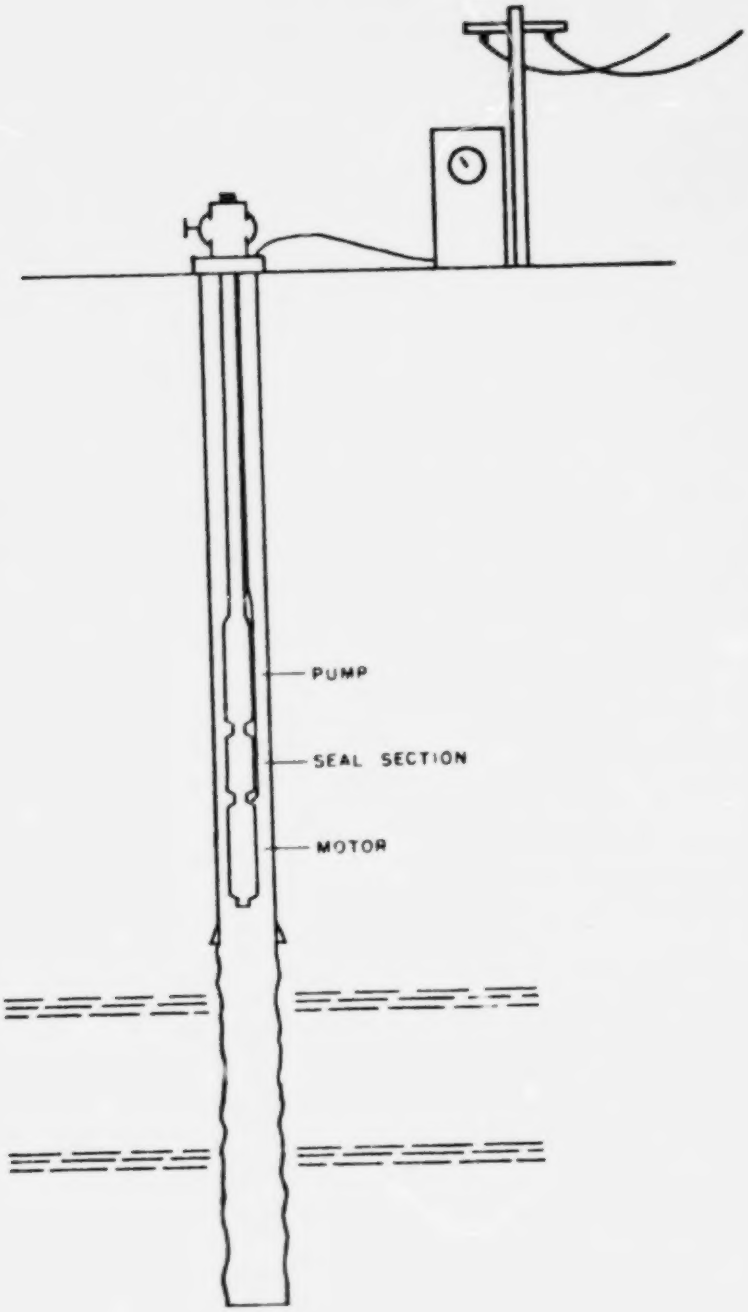

PUMP
SEAL SECTION
MOTOR

FIGURE II-4. SUBMERSIBLE PUMP

TABLE II-1

PRODUCTION OF CRUDE OIL

(millions of barrels)

Production Area	Production		
	1973	1974	1975
Rangely Field	19.378	20.294	--
Colorado	36.590	37.508	38.089
EPA Region VIII	266.5	271.6	--
United States	3360.9	3202.6	3056.8

The Rangely field has been under waterflood since October, 1958. Waterflooding is a recovery technique designed to increase oil recovery and/or profitability of producing oil. The production of oil and gas from a reservoir is accompanied by reductions in reservoir pressure which create decreases in production rate capability. In waterflooding, water is injected into the reservoir at a pressure higher than the pressure in the vicinity of injection. The injected water increases reservoir pressure and displaces reservoir fluids toward areas of lower pressure, normally the areas surrounding producing wells.

The Rangely injection water consists of White River water and produced water which is re-injected. The total daily injection rate is approximately 304,000 barrels per day. White River water accounts for 77,000 barrels per day and is considered to be consumed water. Other pertinent data for the Rangeley field are presented in Table II-2.

Two locations were chosen for tandem siting of the ambient air monitoring stations. These sites were chosen so that two stations at each location could be used to obtain simultaneous upwind and downwind concentrations. In this way the contribution

TABLE II-2

BASIC DATA

RANGELY WEBER SAND UNIT

RANGELY FIELD, COLORADO

Producing Formation	Weber
Average Producing Depth	6500 ft.
Average Reservoir Thickness	700 ft.
Productive Area	19,153 acres
Original Oil in Place	1.6 Billion Bbls.
Estimated Ultimate Oil Recovery	723 Million Bbls.
Cumulative Oil Production*	510,255,473 Bbls.
Cumulative Water Injection*	1,090,295,217 Bbls.
Original Average Reservoir Pressure	2750 psig
Present Average Reservoir Pressure*	1995 psig
Date Unitized	October 1, 1957
Injection Patterns	Peripheral, 5 Spot, Diagonal & Crestal line drive
Injection fluids	Water Gas
Date Injection Commenced	Water: Pilot phase 12/57, Full scale 10/58 Gas: Commenced 11/50, Terminated 5/69 WAG: Pilot Phase 1/72 Terminated 8/73

Number of Wells	Active	Inactive	P & A	Total
Oil Producers*	324	36	6	366
Water Injectors*	193	38	49	280
Gas Injectors*	0	0	0	0
Total*	517	74	55	646

*Data as of July 1, 1975

of a particular source could hopefully be obtained. The factors that were used in selecting the actual sites were:

1) Types of wells or units in monitoring area,
2) Location with respect to the rest of the field,
3) Potential sources of emissions in the area,
4) Access and terrain, and
5) Availability of power.

Two sites were chosen on the perimeter of the field in expectation that the proper wind direction would give minimum background levels at the station nearest the perimeter. The northwest site was the most successful in this respect and provided the most accurate assessment of the contribution of the oil and gas field.

The initial portion of the testing was conducted at Pan American Well 9-X on the southeastern edge of the oil and gas field. Station 034 was sited north of the well and Station 033 was sited south of the well. The locations of the monitoring trailers with respect to the well are shown in Figure II-5. Fugitive emission sampling at Well 9-X was conducted simultaneously with the ambient monitoring. Figure II-6 shows the location of Well 9-X with respect to one of the monitoring stations. Well 9-X was a gas engine rod pump well; another view of the well is shown in Figure II-7.

The latter half of the testing was conducted at Collection Station Number 1 in the northwestern portion of the

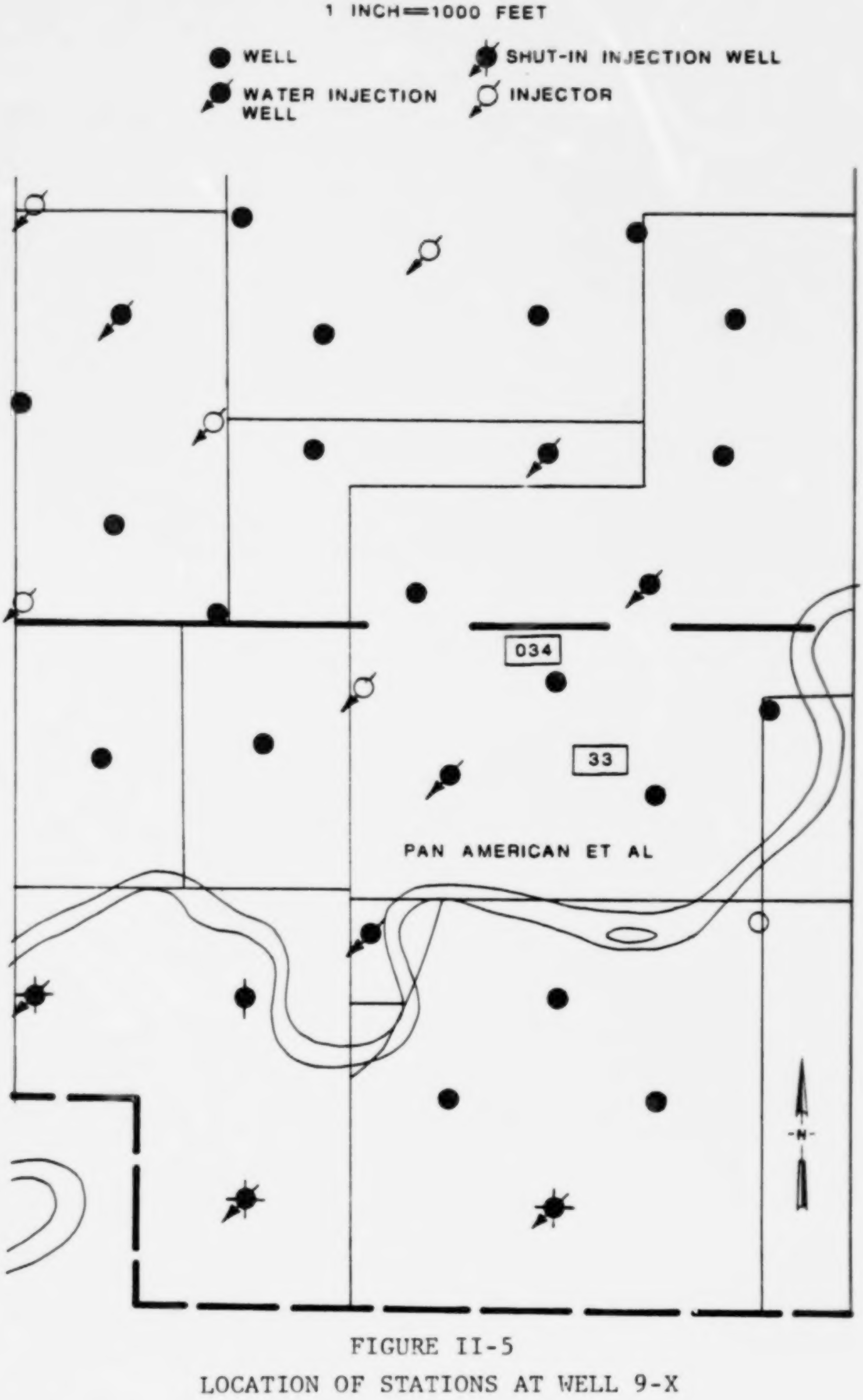

1 INCH=1000 FEET
WELL
SHUT-IN INJECTION WELL
WATER INJECTION WELL
INJECTOR
034
33
PAN AMERICAN ET AL
N

FIGURE II-5
LOCATION OF STATIONS AT WELL 9-X

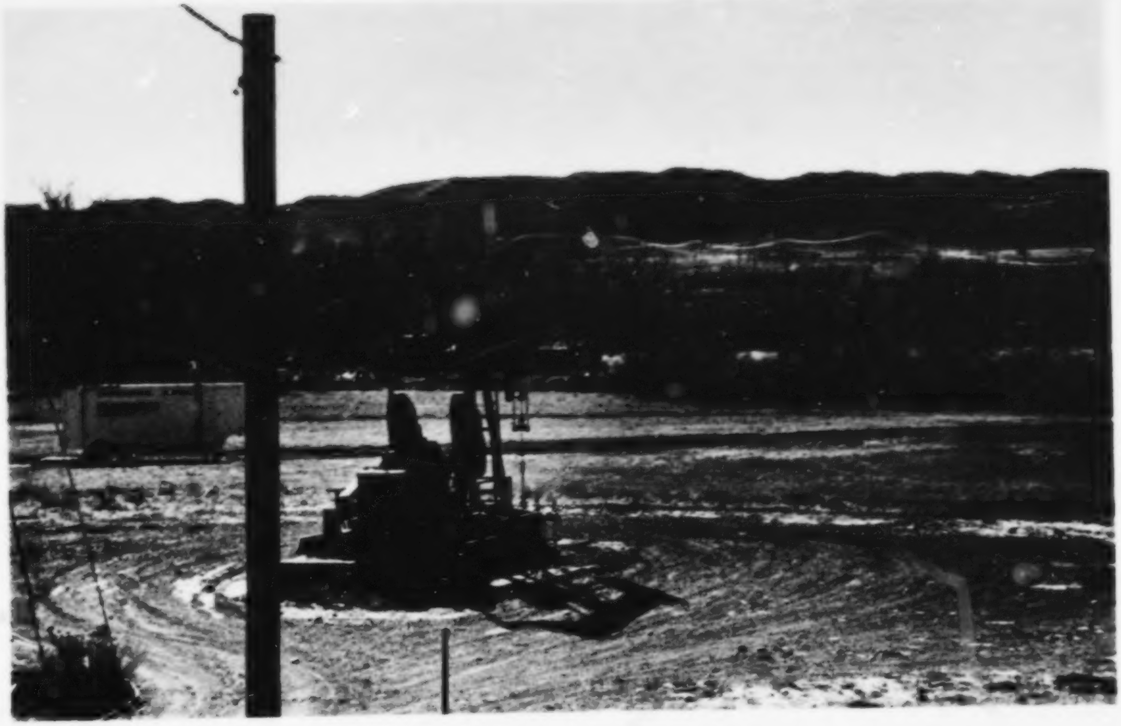


FIGURE II-6
VIEW OF WELL 9-X AND MONITORING STATION

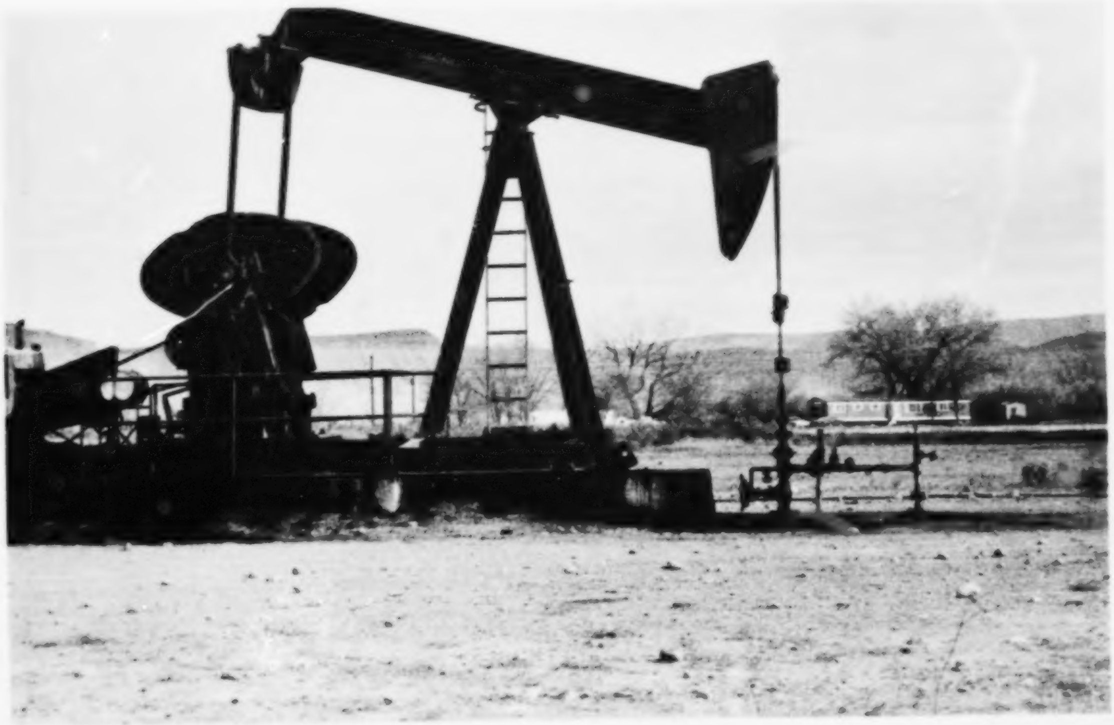


FIGURE II-7
WELL 9-X

field. Fluids produced from the Rangely wells are mixtures of oil, gas, and water which must be separated. Collection stations are surface separation units that serve a number of wells. A diagram of a collection station is given in Figure II-8.

Trailer 034 was located west of the collection station near the perimeter of the field where there would be little influence from the field due to prevailing wind conditions. Trailer 033 was sited east of the collection station near Pan American Well 6, a submersible pump. A view of Well 6 is shown in Figure II-9. The latter site was subject to the influence of the collection station and several producing wells. The combination of monitoring sites during this phase helps to assess the contribution of the oil and gas field on air quality. The locations of the monitoring trailers with respect to the collection station is shown in Figure II-10.

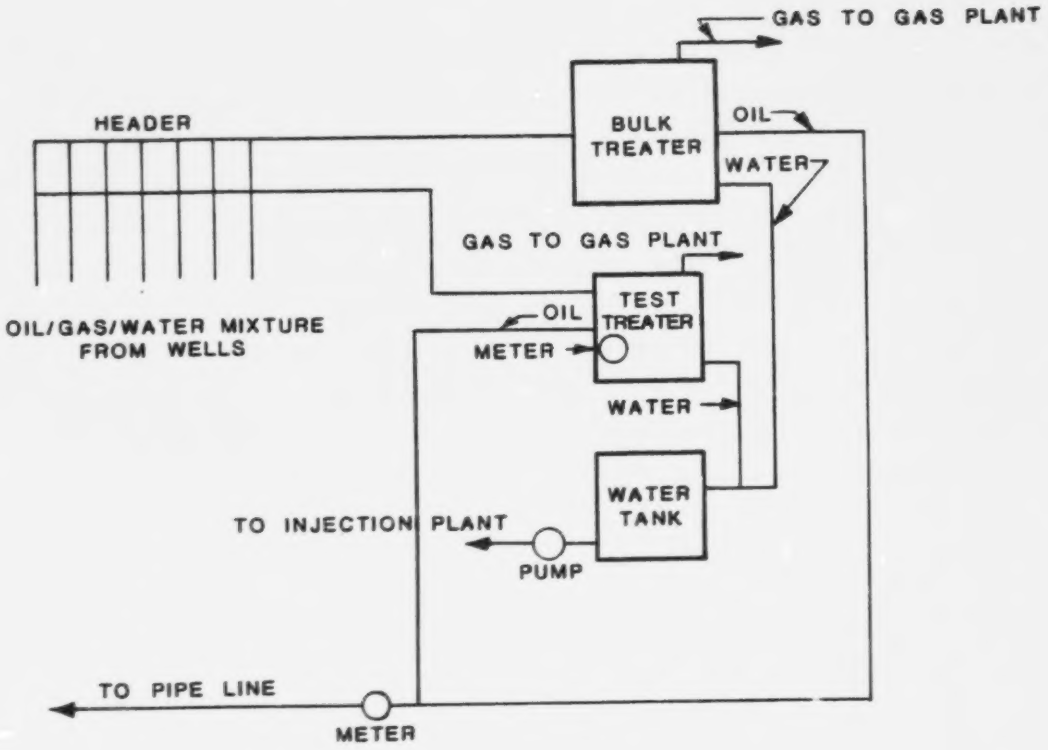

GAS TO GAS PLANT
HEADER
BULK TREATER
OIL
WATER
GAS TO GAS PLANT
TEST TREATER
OIL
METER
OIL/GAS/WATER MIXTURE FROM WELLS
WATER
WATER TANK
TO INJECTION PLANT
PUMP
TO PIPE LINE
METER

FIGURE II-8
COLLECTION STATION

FIGURE II-9

VIEW OF SUBMERSIBLE PUMP WELL 6

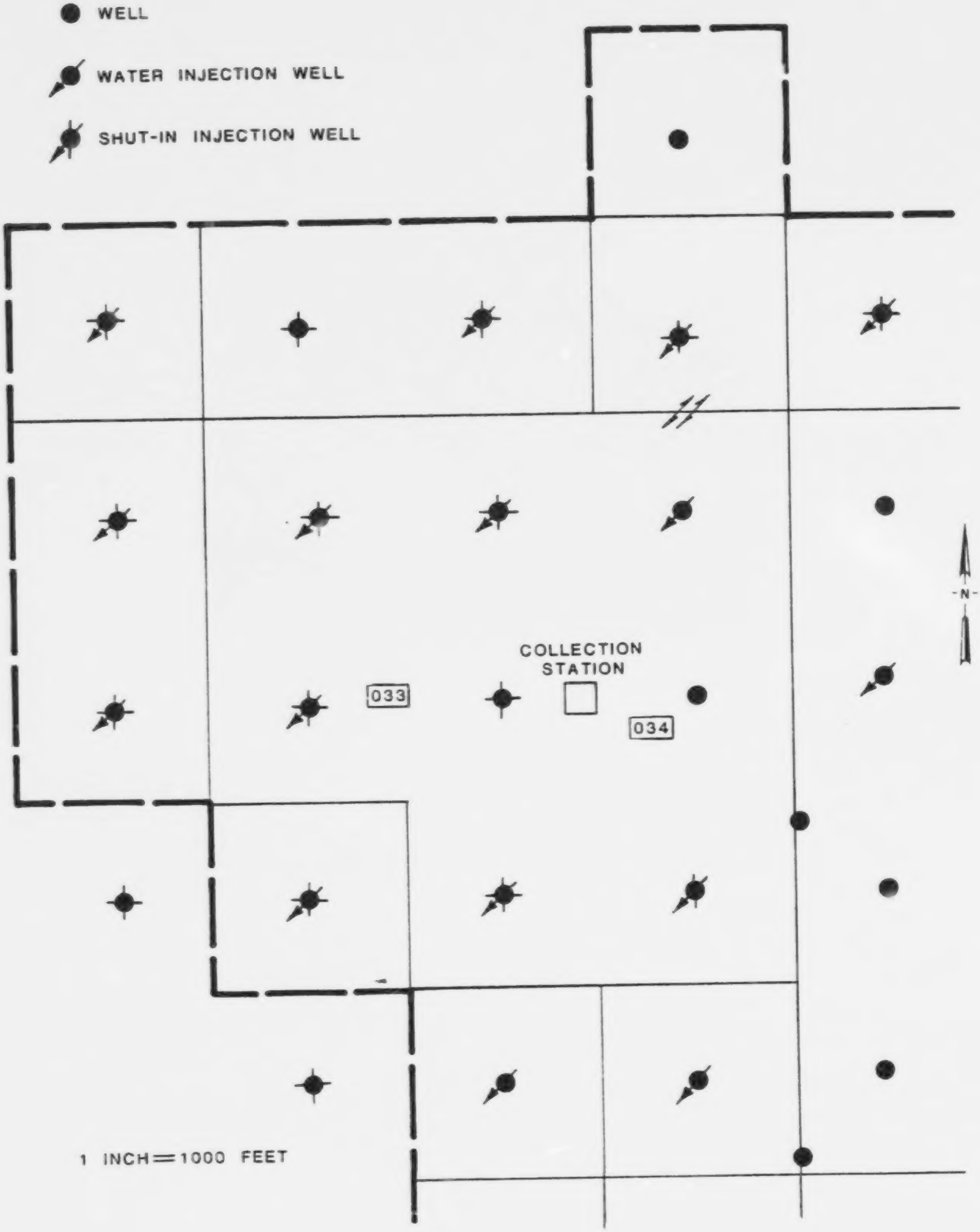

WELL
WATER INJECTION WELL
SHUT-IN INJECTION WELL
COLLECTION STATION
033
034
N
1 INCH = 1000 FEET

FIGURE II-10
LOCATION OF MONITORS AT COLLECTION STATION

III. EXPERIMENTAL

This section describes the procedures and equipment used for both the ambient air monitoring and the fugitive emission sampling.

A. Ambient Air Monitoring

Ambient air monitoring techniques were employed to determine the air quality in the immediate vicinity of the field sources. The ambient air monitoring stations were operated adjacent to Well 9-X from November 22 to December 1, 1976. The stations were then moved to the vicinity of Collection Station Number 1 and operated from December 1 to December 11, 1976.

For the ambient air quality monitoring portion of the study, Radian used two of its continuous monitoring systems housed in a twenty-six foot steel van. This van, pictured in Figure III-1, provides a stable environment for the computer-controlled data acquisition system and air quality instrumentation. Two monitoring systems were provided for each site and monitored sulfur dioxide, hydrogen sulfide, total hydrocarbons, methane, carbon monoxide, oxides of nitrogen, ozone, wind speed, wind direction, and temperature. Particulates were not measured during this study.

Air Quality Instrumentation

The air quality analyzers were multi-point calibrated at the beginning of the program and zeroed and spanned daily.

Nitrogen oxides were measured with a Meloy Model NA520 analyzer. This dual-channel analyzer is based on the chemiluminesent principle, and continuously monitors both NO_x and NO. A

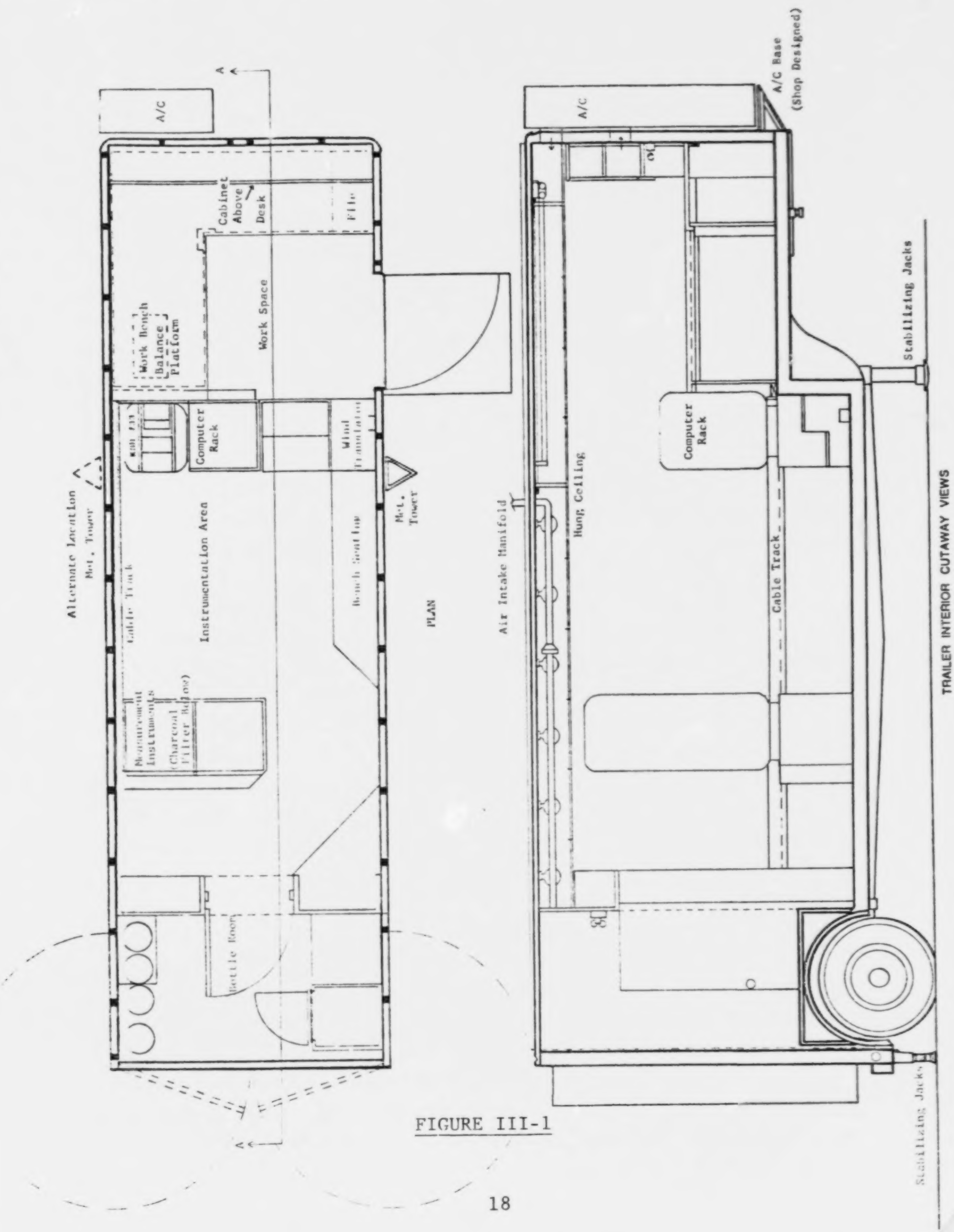

A/C
A
Cabinet Above Desk
File
Work Bench
Balance
Platform
Work Space
Computer Rack
Alternate Location
Met. Tower
Cable Track
Instrumentation Area
Bench Seating
Met. Tower
PLAN
Measurement Instruments
(Charcoal Filter Below)
Bottle Room
A/C
A/C Base
(Shop Designed)
Stabilizing Jacks
Computer Rack
Hung Ceiling
Air Intake Manifold
Cable Track
Stabilizing Jacks
TRAILER INTERIOR CUTAWAY VIEWS

FIGURE III-1

subtraction circuit in the instrument provides a continuous NO_2 output, but is not used in Radian's system. NO_2 is calculated by the computer by subtracting the NO value from the NO_x value, thus avoiding any drift which might occur in the NO_2 output of the instrument. This instrument was multi-point calibrated with NBS span gas using a dilution system. Span checks were made with a NO in nitrogen cylinder referenced to NBS. The NA520 has a minimum detectable sensitivity of 5 ppb (parts per billion) and a linearity of ±1 percent.

Both sulfur dioxide and hydrogen sulfide were measured with Meloy Model SA185 sulfur analyzers. The hydrogen sulfide analyzer uses a Meloy Model SO_x-1 sulfur dioxide scrubber and the sulfur dioxide analyzer uses a Meloy hydrogen sulfide scrubber. The Model SA185 is a continuous analyzer, and utilizes the flame photometric principle of operation. The minimum detectable sensitivity is 5 ppb, and the linearity is ±1%. SO_2 permeation tubes calibrated by the NBS were used to calibrate the analyzers.

The Meloy Model OA350-2R Ozone Analyzer was used to monitor ozone. This continuous analyzer is based on the chemiluminescent principle and is EPA approved as an equivalent method for ozone. The analyzer was calibrated by the NBKI method as specified by the Federal Register, and its internal span source was verified for span checks. The minimum detectable sensitivity of this analyzer is 0.5 ppb, and the linearity is ±1%.

Total hydrocarbons, methane, and carbon monoxide were monitored with a Bendix Model 8200 gas chromatograph analyzer. This instrument uses a flame ionization detector and has a minimum detectable sensitivity of 5 ppb for all three components. The Model 8200 works on a five-minute cycle, i.e., one air sample is analyzed every five minutes, and the result is displayed for five minutes via a sample and hold circuit. The

Model 8200 was calibrated with undiluted span gas obtained from Scott Environmental Technology. This span gas contained methane and carbon monoxide in air; methane was used to calibrate both the THC and the CH_4 channels. A cylinder of CO in nitrogen obtained from NBS was used as a further check on the CO channel.

The air sample was drawn in through a glass cane and manifold supplied by the Ace Glass Company. The system had a 25 mm diameter, and a constant air flow through the system was provided by an air pump rated at 60 cfm at 0" head pressure. The manifold has sampling ports to which 1/4" Teflon lines to the instrument were connected. All joints in the sampling system were secured by 0-ring compression fittings. The manifold was contained in a heated (100°F) chamber to prevent condensation of moisture from the atmosphere.

Meteorological Instrumentation

The meteorological instrumentation consisted of a low threshold cup anemometer and light weight wind vane, a humidity sensor, and a temperature sensor. The temperature sensor was mounted inside a radiation shield, the Model TT-102 Radiation Shield for Temperature Sensing Devices by Texas Electronics. All meteorological instrumentation was mounted atop a 10-meter retractable tower.

The anemometer was the Model W103 Cup Anemometer by Weather Measure. This is a high response, low threshold wind system. Sealed and shielded stainless steel permanently lubricated bearings and stainless steel precision ground shafts are used exclusively. The anemometer has an accuracy of ±1% or .15 miles per hour, whichever is greater. The threshold is 0.6 miles per hour, the distance constant is 5 feet, and the range is from 0 to 100 miles per hour.

The wind vane was the Model W104-2 Light Weight Vane by Weather Measure. This vane features a special low density, high structural strength foam plastic tail coated with a high density epoxy and bonded to a stainless steel rod. A 1000 ohm, low-torque wire-wound potentiometer, supplied with two wipers for a 0° to 540° system, is standard. The response characteristics of the W104-2 are:

- Dead Band: 0 degrees
- Damping Ratio: 0.4
- Distance Constant: 3.5 feet
- Threshold: 0.75 miles per hour
- Potentiometer Linearity: ±0.5%
- Range: 0 to 540°

The humidity sensor was the Model 2013 Remote Reading Relative Humidity System by Texas Electronics.

Data Acquisition System

The basis of the data acquisition system was a Data General NOVA 1200 minicomputer. The NOVA, which has a basic cycle time of 1.2 μsec was equipped with automatic program load and power fail/automatic restart features. The computer utilized 8K 16-bit words of core memory. Analog-to-digital conversion was accomplished via an ADC built by Radian Corporation. The input/output unit for the system was Texas Instrument's KSR 733 keyboard/printer. This teletype provided keyboard entry and a hard copy printed output. The data were also recorded on a cassette magnetic tape unit with three drives. The cassette unit is utilized for program storage and loading as well as recording. Several important functions in the instruments as well as in the computer and the trailer were monitored by lights on a System Status Panel. These data lights were written onto cassette tape to monitor the complete status of the system every five minutes. Each channel was sampled once every second, and the values were compiled into five-minute averages.

B. Fugitive Emission Sampling

Producing wells and collection stations were leak tested for fugitive emissions. If a piece of equipment was found to have a leak, the leak rate was measured, and the emission was analyzed for hydrocarbon and sulfur species.

Leak Detection

All units to be sampled were first inspected to determine if cleaning was necessary. Residue build-up on valves, flanges, and other types of coupling could have produced significant background errors in the results which would have lead to a distorted analysis of the fugitive emission rates. The two producing wells and various parts of the collection station were steam cleaned because of the heavy build-up of residue. The steam cleaning was followed by brushing, application of a solvent, and repeated rinsing with water.

Leaks at the various sampling locations were detected by spraying the units with a pressure sprayer filled with a soap solution. Leaks produced a bubbling effect at the source of the leak. This technique is suitable for detecting even very small leaks. Squeeze bottles of Snoop were also used to detect leaks.

Leaking units were photographed and documented according to the type and size of unit, i.e., (2-inch valve, 6-inch flange, etc.), location of the leak on the unit (valve stem, etc.), type of emission (gaseous, liquid), and arbitrary leak rate. A sample form for documenting the units tested is given in Table III-1. Figure III-2 shows a number of different types of units that were leak tested and sampled. The leak rate designations included 1) jet-type, 2) large, and 3) slow and minute. These designations will be discussed further.

Sampling Procedures

After a leak had been detected, the leak was bagged, the leak rate was determined, and a sample was analyzed for hydrocarbon and sulfur species.

A baggable source was any unit or component which could be completely enclosed by shaping a flexible sheet of mylar plastic around it, thus sealing the unit completely from the atmosphere. This procedure insured the integrity of the bagged sample by preventing atmospheric contamination. Examples of baggable units included valves, flanges, and similar equipment that could be enclosed by the sheet. Non-baggable sources were those units which were of such a size as to make bagging impractical or units which had minute leaks. The details of the sample collection are given below.

Once a leak had been found and was determined to be baggable, the leaking unit was covered with a best fit sheet of mylar plastic with a thickness of 10 thousandths of an inch and equipped with a 1/4-inch nylon bulkhead fitting. This bulkhead fitting served as an injection and/or withdrawal port. Mylar was chosen as the bagging material because it is relatively inert and strong. The mylar sheets were wrapped around each unit and taped to form an air tight shroud.

The leak rate was determined by connecting a 1/4-inch tee to the bulkhead fitting on the bag. One side of the tee was connected to a water manometer and the other to a dry gas

TABLE III-1
SAMPLE DOCUMENTATION FORM
UNIT INFORMATION

Unit

Inspection Number

Unit Number

Sample Method

Leak Type

Product

Time

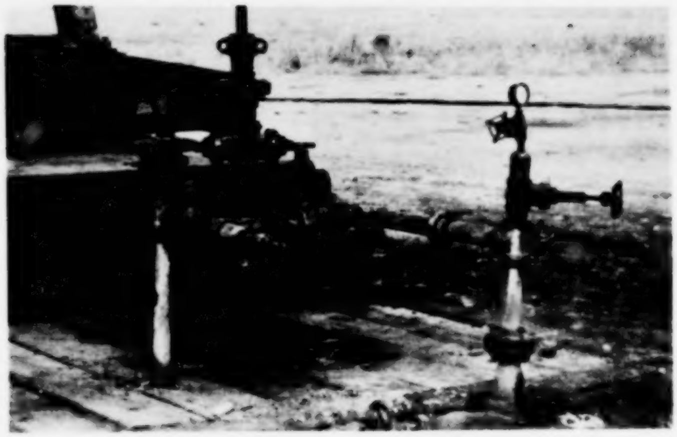
Date

Line Temp.

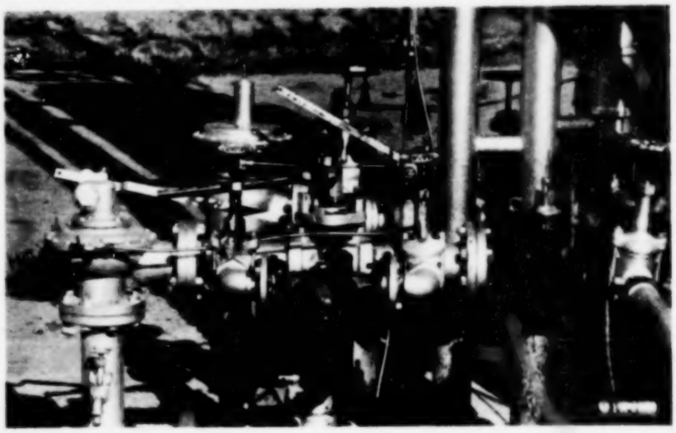
Line Pressure

Location

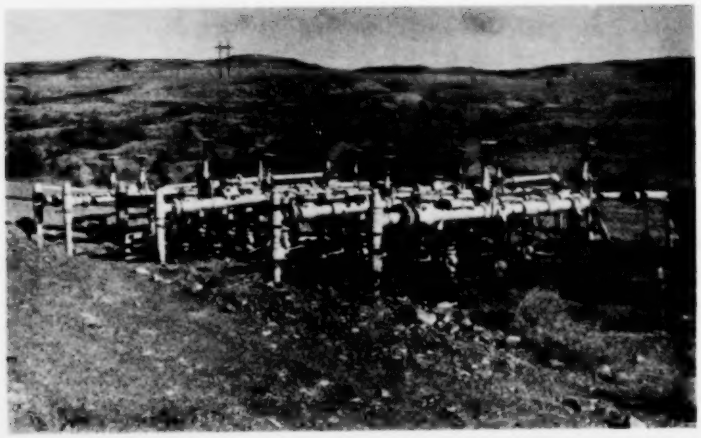
Remarks



Rod Pump Wellhead



Units on Collection Station Treater



Well Manifold At Collection Station

FIGURE III-2 EXAMPLES OF UNITS SAMPLED DURING STUDY

meter or bubblementer. The manometer measured the pressure drop across the orifice, and the dry gas meter or bubblementer measured the volume of gas flowing through it. The volume of gas, as determined by the dry gas meter, was observed for an elapsed time of generally one or two minutes. By dividing the volume of gas in liters by the elapsed time in mintes, an uncorrected leak rate was determined. This value was then corrected for the pressure drop using the barometric station pressure. The manometer reading was converted from inches of water to inches of mercury and then used in the following equation for the corrected leak rate:

$$\text{Leak Rate}_{\text{corr.}} = (\text{Leak Rate})_{\text{uncorr}} \left[\frac{\text{B.P. + manometer reading}}{29.92'' \text{ Hg}}\right]$$

The dry gas meter was used to measure large leak rates, but slow leaks were insufficient to produce a positive gas flow capable of being measured on the dry gas meter. When the dry gas meter could not be used, a bubblemeter was substituted for it in the measuring loop. Figure III-3 shows the arrangement for determining the leak rate on a unit that has been bagged.

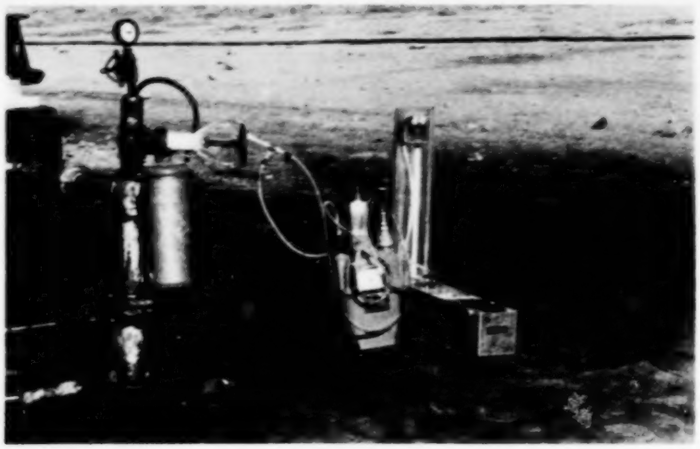


FIGURE III-3

LEAK RATE DETERMINATION

Samples of the gaseous emissions were taken from the bag by introducing a 5.0 cc precision gas sampling syringe through the bulkhead fitting, flushing the syringe four to five times with the gaseous contents of the bag, and then filling the syringe and locking in the contents. The syringe was equipped with mininert valves so that the syringe could be airtight when necessary and so that connection could be made to the bulkhead and repeatedly sample the gases in the bag without the puncturing associated with normal syringe samples. After the valves had been closed and the syringe disconnected, the closed syringe was immediately taken to the instrument trailer where the sample gas could be analyzed by the portable AID chromatograph or the sulfur analyzers. Figure III-4 is a close-up view of a valve that has been bagged and is ready to be sampled.

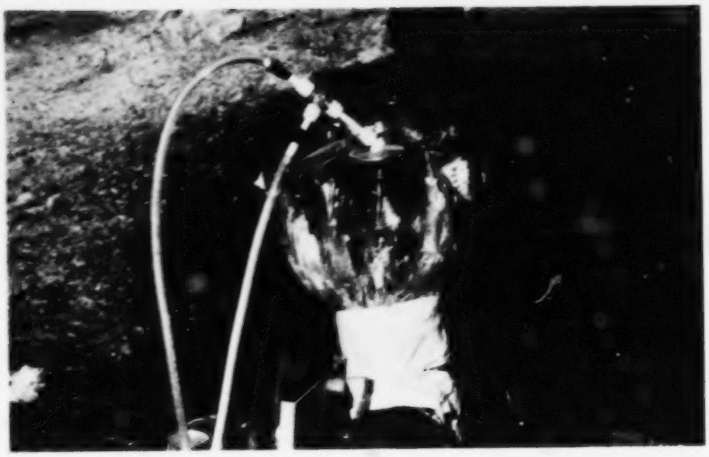


FIGURE III-4

LEAKING VALUE BAGGED FOR SAMPLING

Analytical Procedures

Samples of the fugitive emissions were analyzed for total hydrocarbons, specific hydrocarbon species, sulfur dioxide, and hydrogen sulfide. The emphasis was upon the quantitative total hydrocarbon analyses. All analyses required sample dilution.

All hydrocarbon analyses were performed using an AID Model 511 Portable Gas Chromatograph. Once a sample had been collected and carried to the analysis area, it was necessary to dilute the sample to bring the hydrocarbon concentration down into a measurable range. A 100:1 dilution was the most suitable since this dilution would bring a 100% hydrocarbon mixture into the 1.0% or 10,000 ppm range which was the approximate upper limit of the standard hydrocarbon gas used to calibrate the chromatograph. Care had to be taken to use ultra-pure air (<1 ppm THC) for the dilution process because the ambient concentration of hydrocarbons was sufficient to introduce error. To make the dilution with the gas syringes, all but 0.5 ml of the sample gas was forced out of the syringe, then refilled with ultra-pure air. After locking this mixture in the syringe with the mininert valve, the plunger was cycled four to five times to thoroughly mix the contents. Again all but 0.5 ml of this gas was forced out and the syringe refilled with ultra-pure air and mixed thoroughly as before. The sample was then ready for analysis.

To analyze the gaseous emissions both quantitatively and qualitatively, an AID Model 511 gas chromatograph equipped with a flame ionization detector was used with nitrogen as the carrier gas and ultra-pure hydrogen and compressed air for the flame detector. The calibration of the gas chromatograph was performed daily with standard hydrogen gases. Dilutions of a span gas were made to approximately 1000, 2000, 4000, 6000, and

10,000 ppm concentrations using the same method as the sample dilution process. The various concentrations of standard gases were injected into the gas chromatograph using the total hydrocarbon mode (column bypass) and the peak heights observed. After measurements, all peak heights were converted to the corresponding peak height of a standard attenuation setting. These peak heights were then used to construct a calibration curve of peak heights versus hydrocarbon concentration. A sample curve is shown in Figure III-5. A calibration curve was prepared each time that analyses were performed. When the diluted gaseous sample was injected into the GC, its peak response was recorded and the concentration obtained from the calibration curve. This value was then corrected for the dilution factor to obtain the hydrocarbon concentration present in the original gaseous emission. The GC conditions were kept constant throughout all testing to obtain consistent results.

The various hydrocarbon species present in the gaseous emissions were qualitatively analyzed using a column packed with 80-100 mesh chromosorb 102. Standard samples of methane, ethane, and propane were injected into the GC, and their retention times were noted. These species eluted as expected with the lightest being eluted first. Next samples of the gaseous emissions were injected and analyzed for the various species.

Hydrogen sulfide and sulfur dioxide were analyzed for in the fugitive gaseous emissions by using the sulfur analyzers in the monitoring trailers. Five ml samples were taken from the bagged sources as previously described and then injected into six-liter Tedlar bags equipped with screw-type valves. The Tedlar bags which had been partially filled with ultra-pure air were then filled to capacity with ultra-pure air and kneaded to insure proper mixing. The Tedlar bags could then

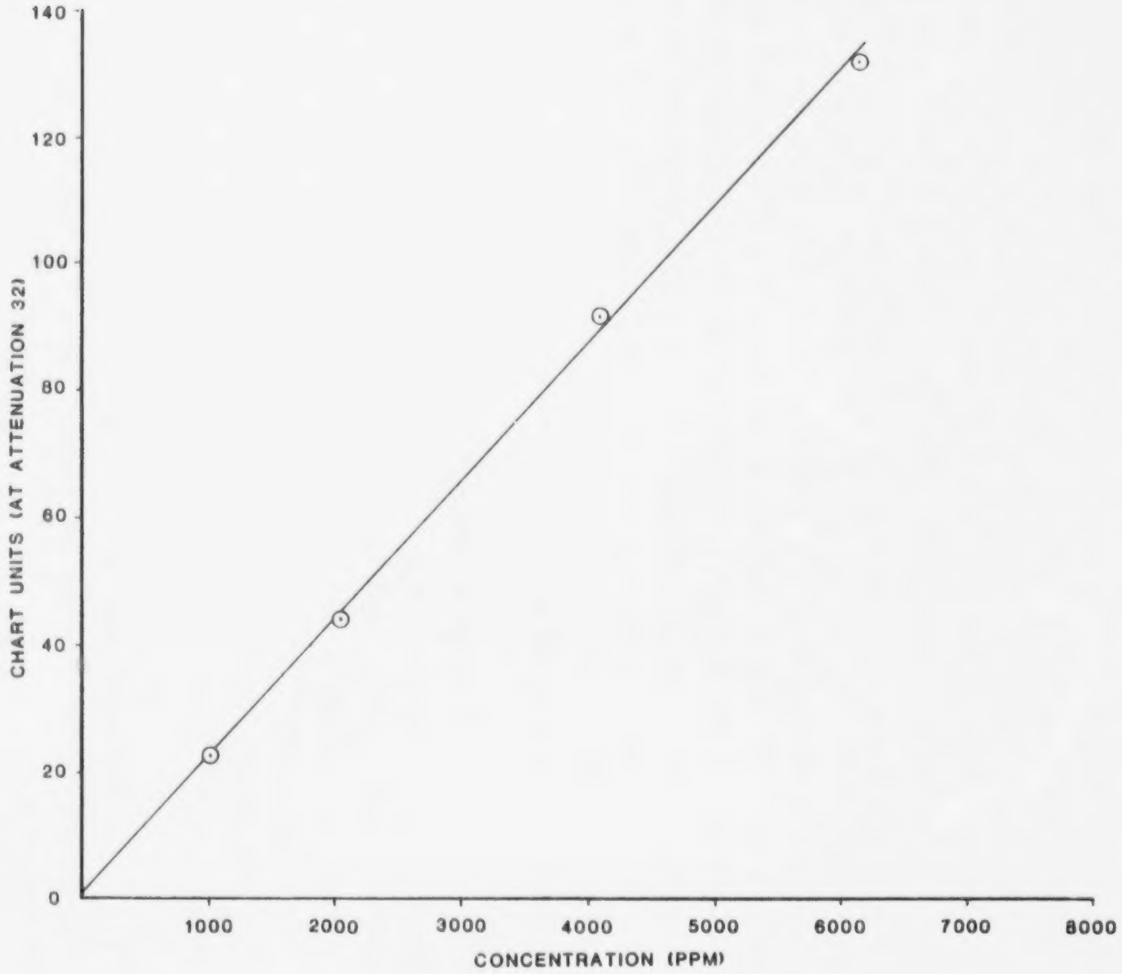


FIGURE III-5. SAMPLE CALIBRATION CURVE FOR GAS CHROMATOGRAPH

be connected to the inlet ports of a sulfur analyzer and treated as ambient samples. The process was to first attach the Tedlar bag in series with an H_2S scrubber and the sulfur analyzer which would give the SO_2 concentration of the gaseous emission. The scrubber would then be removed and the sample drawn directly into the analyzer. This step would give the total sulfur concentration and the H_2S concentration could be derived by difference.

IV. RESULTS

A. Fugitive Emission Sampling

Gaseous, gas/liquid, and liquid leaks were detected in the oil and gas field. The emphasis in this program was on gaseous leaks which fall into the two categories of baggable and non-baggable leaks.

Not all units leaked at the same rate, so leaks were divided into sub-groups according to their emissions rates. Leaks were classified as (1) minute and slow leaks, (2) fast or large leaks, and (3) jet-type leaks. Slow and minute leaks were those that were not apparent upon visual inspection but which caused a "nesting" of bubbles when sprayed with soap solution. A slow leak would have an emission rate of 0.5 ml or less per minute. This is an arbitrary unit and serves as an indicator of the range. Slow and minute leaks were arbitrarily assigned leak rates of 20 ml/hour because such leak rates could not be precisely determined. Large leaks are defined as leaks that can be felt with the finger but not of the jet-type. Jet-type leaks are high-pressure leaks that can be heard or seen. These leaks are easily characterized.

Most leaks were in the minute-slow category and could only be detected by the nesting of the soap solution around the leak. Several jet-type leaks were found, and some could be heard up to 100 feet away. Most large leaks were around the cap and stem of various sizes of valves, while most of the smaller leaks were found in lines around smaller fittings.

A few liquid leaks were observed, and one particular valve had an intermittent gas/liquid leak. While the gaseous part of the leak was continuous, the liquid portion was not continuous and would flow at seemingly random intervals. This liquid leak would flow virogously for periods of eight minutes or longer and then cease. The liquid leak rate was measured at 18.2 ml/minute. No operating procedure or parameter could be definitely identified as causing the intermittent liquid leak. Most liquid leaks noted during the study were so small that they were only detected by the build-up of residue over a long period of time.

There were potential sources of emissions in the field that could not be sampled because of physical dimensions or structures. These sources included oil storage tanks, water tanks, oil spills, old mud pits and sumps, etc.

The results of the leak detection findings are given in Table IV-1. The leak survey identifies the types and numbers of components that were checked and the range of leak rates that were observed. The leaking units were found after testing three electric submersible wells, four rod pump wells, and a collection station. The percentage of leaking units was 9.7% of the total checked.

During the leak survey, some leak rates were found to vary with time. This condition was initially found when testing the same locations on separate days; also, the leak rates could vary within short periods of time as indicated by the example in Table IV-2 for two valves at Well 9-X. However, most leak rates were constant, and those leak rates that varied did not give noticeable changes in the concentrations of components.

Fugitive emissions from leaking units were analyzed for total hydrocarbons, specific hydrocarbons, and sulfur compounds. Emission data, including hydrocarbon content and rates, are given in Table IV-3. The emission data are the results at seven producing wells and one collection station.

TABLE IV-1

LEAK SURVEY[1]

Type of Unit	No. of Units Checked	No. of Leaks Detected	Percentage Leaking	Minimum Leak Rate	Maximum Leak Rate
Valves	156	25	16.0	0.020 l/hr.	15.6 l/min. (936 l/hr.)
Flanges	36	0	0	NA	NA
Connectors (tees, elbows, unions, etc.)	148	2	1.4	0.020 ml/hr.	0.020 ml/hr.[2]
Swagelock-Type Fittings	31	9	29.0	0.020 ml/hr.	0.020 ml/hr.[2]
TOTAL	371	36	9.7	--	--

[1] The survey was conducted on three submersible pump wells, four rod pump wells, and one collection station.

[2] All leaks for connectors and Swagelock fittings were slow leaks and were arbitrarily assigned rates of 20 ml/hr.

TABLE IV-2
VARIATIONS IN LEAK RATES

Number	Site	Type Unit	Date	Time	Leak Rate (liters/min.)
1	Well 9-X	valve	11/22/76	1100	2.37
				1200	6.18
2	Well 9-X	valve	11/22/76	1215	2.18
				1400	1.41

The emission results are presented on the basis that the hydrocarbon content is measured as methane. The emission rates were calculated on a daily basis from the hydrocarbon composition and the leak rate. The production rates for each well allowed the calculation of an emission factor as well as an emission rate per well.

Table IV-3 presents data for only a portion of the collection station. Not all of the possible fugitive emission sources could be sampled at the collection station, and a complete emission value for the entire station could not be obtained. Several structures such as a large tank open to the air could not be sampled with the available equipment. There were also enclosed portions of treaters that had definite fugitive leaks, but hydrogen sulfide had collected inside these structures, and it was deemed unsafe to work inside these structures for the extended periods required to sample and make accurate leak rate determinations. Ambient samples were taken of the air inside one of the heaters at the collection station and analyzed for SO_2 and H_2S. The results indicated levels of 4 ppm SO_2 and 19 ppm H_2S.

In addition to total hydrocarbon analyses, the emissions were also analyzed to determine specific hydrocarbon components. Methane, ethane, propane, and varying amounts of what were probably isomeric butanes were found in the fugitive emissions. The butanes and higher molecular weight hydrocarbons were almost negligible. The exact amount of each species varied with sampling location. Table IV-4 presents the results of the specific hydrocarbon analyses; the individual species are presented as percentages of the total hydrocarbon content and not of the total stream.

TABLE IV-3

EMISSION DATA

Production Unit	Type of Unit	Production Rate BOPD	Production Rate BWPD	Number of Leaks	Percent Hydrocarbon	Emission Rate (Lbs. Hydrocarbon/Day)	Emission Factor (Lb. Hydrocarbon/Barrel Oil)
9-X	RP	23	45	8	87	16.5	0.717
6	ES	122	1542	1	90	0.007	5.7×10^{-6}
35	ES	NA	NA	1	82	23.4	-
36	ES	55	1050	1	78	0.009	1.6×10^{-5}
2	RP	32	25	1	--	< 0.0010	3.1×10^{-5}
3	RP	60	187	0	--	None	0
7	RP	NA	NA	0	--	None	0
Sta. 1*	Coll. Sta.	--	--	24	94	22.6*	-

RP - Rod pump well

ES - Electric submersible well

STA - Collection Station No. 1

NA - Not available

* The emission values for Collection Station No. 1 do not include all possible fugitive emissions.

TABLE IV-4

HYDROCARBON ANALYSES RESULTS

Leak Number	Producing Unit	Type of Unit	Percent Total Hydrocarbon(THC)	Percent CH_4	Percent C_2H_6	Percent C_3H_8
1	Well 9-X	valve	87	54.6	22.6	22.8
2	Well 9-X	valve	87	54.4	21.4	24.2
3	Well 9-X	valve	87	54.9	22.8	22.3
9	Collection Station	valve	94	46.7	30.8	22.5
10	Collection Station	valve	94	45.4	30.4	24.2

NOTE: The individual hydrocarbon components are presented as percentage of the total hydrocarbon rather than as percentages of the total emission flow.

The fugitive emissions contained both SO_2 and H_2S. The SO_2 concentrations varied generally between 3 ppm and 10 ppm. However, H_2S concentrations were much higher, ranging as high as 1200 ppm in the undiluted gaseous emissions. Analyses of the sulfur species in fugitive emissions are presented in Table IV-5.

B. Air Quality Results

The diurnal variations of the important air quality and meteorological parameters are summarized in Tables IV-6 through IV-24. Tables are not given for SO_2 and NO_x because the concentrations were negligible throughout the study. The SO_2 was below detectable limits at all times. The ozone concentrations were also not significant, which is reasonable for the time of year when the monitoring occured. If there was little difference in the parameter measured at each trailer at one of the sites, only the results of Trailer 034 are given. This situation was common at Well 9-X where the trailers were close together and emissions were not sufficient to cause a significant difference between upwind and downwind stations.

Tables IV-6 through IV-13 give the results of the monitoring at Well 9-X. Tables IV-14 through IV-24 present the results of the monitoring near the collection station. The important air quality results are those for H_2S, THC, and CH_4. These parameters were the ones most affected by the oil and gas operations.

When the stations were located near Well 9-X, there were no significant differences between the measurements at the two stations. Traces of hydrogen sulfide were detected, but there were no values above 19 ppb. Total hydrocarbon concentrations exceeded 50 ppm for extended periods as noted

TABLE IV-5

SULFUR ANALYSES

Leak Number	Producing Unit	Type of Unit	SO_2 (ppm)	H_2S (ppm)
1	Well 9-X	valve	7.2	326
9	Collection Station	valve	9.6	529
10	Collection Station	valve	3.0	600
11	Collection Station	valve	8.4	1200
35	Well 37	valve	3.6	345
36	Well 26	valve	10.8	1200

in Table IV-9. These high concentrations were mainly due to nonmethane hydrocarbons. The total hydrocarbon and methane concentrations are compared in Figure IV-1.

When the two monitoring stations were located near Collection Station No. 1, there were significant differences in the H_2S and the measurements. Station 034 located upwind and on the perimeter of the field recorded lower values for both parameters. Station 034 recorded H_2S levels above the minimum detection sensitivity only 6.6% of the time, while Station 033 recorded levels above this value 53.7% of the time. Station 033 recorded total hydrocarbon concentrations over 50 ppm for approximately 87% of the monitoring, but the THC levels at Station 034 were generally in the 3-6 ppm range except for one brief excursion at the end of the monitoring period. However, the methane concentrations were comparable at both stations for the same periods. Figures IV-2 and IV-3 are graphic comparisons of the differences in the hydrocarbon measurements at the two stations. Station 033 as seen in Figure IV-2 shows the effects of the surrounding sources of emissions.

Table IV-6
Diurnal Variation of Ozone (ppb)
Trailer 034, Well 9-X
Period (11/22/76 to 12/01/76)

	DAY								
HOUR	22	23	24	25	26	27	28	29	30	1
1		2	0	0	29	31	2	3	2	19
2		2	0	0	28	35	2	6	2	20
3		2	0	0	29	35	5	4	1	21
4		0	0	0	29	35	4	2	2	16
5		0	0	0	27	36	9	2	2	16
6		0	0	0	38	35	9	3	1	14
7		0	0	0	28	35	15	15	1	14
8		1	0	0	29	35	18	6	2	12
9		5	5	3	31	36	26	10	5	10
10		15	13	9	31	37	26	19	11	10
11	24	23	20	13	31	37	28	25	16	
12	31	27	24	20	31	39	32	31	21	
13	35	33	33	29	30	42	36	30	26	
14	40	37	35	31	29	40	36	32	30	
15	45	41	31	34	31	39	36	34	29	
16	44	37	30	31	32	39	37	31	30	
17	32	23	32	34	31	37	32	30	26	
18	15	6	7	35	31	29	19	14	21	
19	7	3	1	34	31	16	15	8	20	
20	6	2	1	30	31	17	18	4	17	
21	3	0	0	25	31	18	8	4	14	
22	2	0	0	27	31	17	7	5	9	
23	2	0	0	24	31	9	7	2	4	
24	2	0	0	19	31	2	6	1	5	

Table IV-7
Diurnal Variation of Hydrogen Sulfide (ppb)
Trailer 033, Well 9-X
Period (11/22/76 to 12/01/76)

	DAY									
HOUR	22	23	24	25	26	27	28	29	30	1
1	14	6	7	9	0	0	0	--	0	0
2	11	8	8	8	0	0	0	--	0	0
3	9	7	7	12	0	0	0	--	1	0
4	13	9	11	8	0	0	0	--	1	0
5	13	9	8	9	0	0	0	--	2	0
6	12	13	9	8	0	0	0	--	3	0
7	11	9	7	5	0	0	0	--	0	0
8	9	12	7	6	0	0	0	--	3	0
9	11	11	6	10	0	0	0	0	2	0
10	6	2	1	7	0	0	0	0	0	
11	3	0	0	1	0	0	0	0	0	
12	2	0	0	0	0	0	0	0	0	
13	2	0	0	0	0	0	0	0	3	
14	2	0	0	0	0	0	0	0	4	
15	2	0	0	0	0	0	0	0	1	
16	2	0	0	0	0	0	0	0	0	
17	2	0	0	0	0	0	0	0	0	
18	5	0	0	0	0	0	0	0	0	
19	5	4	4	0	0	0	--	0	0	
20	8	4	10	0	0	0	--	2	0	
21	10	5	6	0	0	0	--	1	0	
22	9	2	6	0	0	0	--	0	0	
23	8	7	3	0	0	0	--	2	0	
24	4	11	6	0	0	0	--	1	0	

Table IV- 8
Diurnal Variation of Hydrogen Sulfide (ppb)
Trailer 034, Well 9-X
Period (11/22/76 to 12/01/76)

	DAY									
HOUR	22	23	24	25	26	27	28	29	30	1
1		10	12	7	0	0	2	7	2	0
2		8	10	9	0	0	3	2	2	0
3		14	9	11	0	0	1	3	6	5
4		6	11	10	0	0	2	7	6	5
5		11	11	13	0	0	1	8	7	2
6		11	9	7	0	0	3	5	8	4
7		8	5	11	0	0	2	0	3	3
8		10	8	9	0	0	0	2	7	6
9		9	4	10	0	0	0	5	6	3
10		0	0	5	0	0	0	1	1	3
11	0	0	0	0	0	0	0	0	0	
12	0	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	3	
15	0	0	0	0	0	0	0	0	0	
16	3	0	0	0	0	0	0	0	0	
17	19	0	0	0	0	0	0	0	0	
18	3	7	2	0	0	0	0	0	0	
19	5	6	6	0	0	0	1	3	0	
20	10	8	5	0	0	0	1	6	0	
21	8	3	2	0	0	2	3	4	13	
22	12	5	7	0	0	0	3	2	19	
23	5	11	4	0	0	0	5	6	6	
24	8	11	14	0	0	0	9	5	6	

Table IV-9
Diurnal Variation of Total Hydrocarbons (ppm)
Trailer 033, Well 9-X
Period (11/22/76 to 12/02/76)

	DAY									
HOUR	22	23	24	25	26	27	28	29	30	1
1		>50	>50	>50	35.6	32.6	--	--	49.9	34.1
2		>50	>50	49.9	35.1	32.4	--	--	47.3	29.2
3		>50	>50	>50	35.2	32.6	--	--	45.6	32.1
4		>50	>50	>50	34.5	33.2	--	--	49.9	32.5
5		>50	>50	>50	34.1	33.6	--	--	>50	33.3
6		>50	>50	49.9	32.0	33.5	--	--	>50	34.4
7		>50	49.8	>50	30.3	33.3	--	--	>50	36.6
8		>50	49.9	49.2	30.6	33.2	--	--	49.9	39.4
9		43.2	45.1	>50	29.3	33.4	--	--	49.3	38.0
10		13.1	40.7	48.4	26.1	33.3	--	--	42.7	15.9
11		11.8	37.1	41.3	23.7	30.7	--	--	39.4	
12		10.5	36.4	37.5	27.3	24.0	--	18.5	37.5	
13		9.5	36.2	36.6	28.8	cal	--	31.4	17.8	
14		14.8	36.0	36.0	30.0	22.8	--	34.3	19.7	
15		12.3	35.8	34.8	30.5	15.8	--	34.6	27.4	
16	14.7	4.2	35.9	34.1	30.2	--	--	34.6	33.1	
17	15.1	13.6	35.9	33.9	28.9	--	--	35.3	34.3	
18	20.0	36.1	41.4	32.9	28.5	--	--	37.1	35.5	
19	20.0	49.2	48.6	32.2	25.7	--	--	38.9	39.1	
20	20.8	>50	>50	32.3	27.6	--	--	44.0	37.0	
21	39.7	>50	>50	33.5	31.0	--	--	>50	32.3	
22	49.1	45.2	>50	33.9	31.6	--	--	48.6	27.4	
23	>50	>50	49.7	34.3	31.6	--	--	47.1	34.4	
24	>50	>50	>50	35.5	31.3	--	--	49.9	45.2	

Table IV-10
Diurnal Variation of Methane (ppm)
Trailer 033, Well 9-X
Period (11/22/76 to 12/02/76)

	DAY									
HOUR	22	23	24	25	26	27	28	29	30	1
1		5.7	7.1	6.2	1.1	0.6	--	--	13.8	2.2
2		5.7	6.4	5.4	0.9	0.6	--	--	11.8	0.8
3		5.7	4.9	6.3	1.2	0.6	--	--	11.1	0.7
4		7.5	6.3	6.1	1.4	0.6	--	--	13.6	0.6
5		7.2	5.9	6.4	1.0	0.6	--	--	13.4	0.7
6		7.8	5.5	5.6	0.7	0.6	--	--	12.9	1.1
7		6.4	5.2	5.3	0.6	0.6	--	--	13.7	1.7
8		7.3	5.7	4.9	0.6	0.6	--	--	12.6	2.4
9		5.2	5.0	5.6	0.6	0.6	--	--	7.9	2.2
10		1.8	3.0	4.8	0.6	0.6	--	--	5.1	
11		1.1	1.5	2.6	0.6	0.6	--	--	3.9	
12		0.9	1.1	1.5	0.6	0.6	--	2.1	2.2	
13		0.8	1.0	1.1	0.6	0.6	--	1.8	2.0	
14		0.8	0.9	0.8	0.6	--	--	1.8	1.9	
15		0.7	0.8	0.7	0.7	--	--	1.5	1.9	
16	0.7	0.7	0.8	0.6	0.7	--	--	1.5	1.7	
17	1.0	0.9	0.8	0.6	0.7	--	--	1.7	1.8	
18	2.4	1.8	1.8	0.6	0.6	--	--	2.6	2.7	
19	2.7	4.9	4.5	0.6	0.6	--	--	4.3	4.6	
20	5.7	4.8	7.8	0.6	0.6	--	--	6.6	3.7	
21	6.0	5.4	6.1	0.6	0.6	--	--	12.6	4.2	
22	6.7	5.2	5.7	1.2	0.6	--	--	9.9	5.4	
23	6.7	6.4	4.6	0.7	0.6	--	--	9.8	8.5	
24	5.8	7.8	6.0	1.0	0.6	--	--	16.0	10.5	

Table IV-11
Diurnal Variation of Wind Speed (mph)
Trailer 033, Well 9-X
Period (11/22/76 to 12/01/76)

	DAY									
HOUR	22	23	24	25	26	27	28	29	30	1
1	0	0	0	1	2	6	1	0	1	17
2	0	0	0	1	1	9	0	0	2	8
3	0	0	0	1	5	7	0	0	1	5
4	1	1	0	1	5	5	0	1	1	5
5	1	0	1	0	7	5	0	0	1	2
6	0	0	0	0	10	6	0	0	0	2
7	1	0	0	1	12	6	0	1	0	1
8	0	0	0	0	8	6	2	3	0	3
9	0	0	0	0	15	8	3	1	1	1
10	0	2	0	0	16	9	0	1	1	4
11	1	0	0	0	17	12	0	1	0	
12	1	0	0	0	14	10	1	2	2	
13	1	0	0	1	14	10	2	1	1	
14	4	0	1	3	16	9	3	2	1	
15	2	0	1	14	17	7	5	2	1	
16	1	0	1	11	16	7	4	0	1	
17	0	1	1	12	14	8	2	1	2	
18	1	1	0	18	12	5	2	2	2	
19	0	0	0	18	16	1	1	1	4	
20	0	0	0	12	11	3	1	1	2	
21	0	0	0	5	7	1	1	1	2	
22	0	0	1	5	10	1	0	1	2	
23	0	0	0	5	9	2	0	1	2	
24	1	1	-	2	8	2	0	1	3	

Table IV- 12
Diurnal Variation of Wind Speed (mph)
Trailer 034, Well 9-X
Period (11/22/76 to 12/01/76)

	DAY									
HOUR	22	23	24	25	26	27	28	29	30	1
1		1	0	1	3	7	1	1	1	16
2		1	0	2	2	9	0	1	2	8
3		1	0	3	6	6	0	0	1	5
4		1	1	1	4	5	0	2	1	2
5		0	1	2	7	6	1	0	1	2
6		0	0	1	10	6	0	1	2	2
7		1	1	2	12	6	2	1	0	1
8		1	0	1	10	7	3	2	1	2
9		0	1	1	16	8	1	3	1	1
10		3	1	1	18	10	1	1	1	4
11	1	1	0	1	18	13	1	1	1	
12	2	1	1	1	15	11	2	1	2	
13	3	0	1	2	13	10	2	2	2	
14	4	1	1	4	15	8	3	2	1	
15	3	1	1	12	15	7	5	1	1	
16	1	1	1	10	16	7	4	2	2	
17	0	1	1	10	13	8	2	0	2	
18	2	1	0	16	10	5	2	1	2	
19	1	0	1	16	15	1	2	1	4	
20	0	1	1	10	12	3	1	1	2	
21	1	2	0	5	8	2	1	1	2	
22	1	0	2	6	9	1	0	1	2	
23	1	0	1	5	10	2	0	1	2	
24	2	1	1	2	8	2	0	1	4	

TABLE IV-13

Diurnal Variation of Wind Direction

Trailer 034, Well 9-X

Period (11/22/76 to 12/01/76)

	DAY									
HOUR	22	23	24	25	26	27	28	29	30	1
1		332	341	347	31	69	335	5	300	320
2		314	336	306	309	70	355	296	332	298
3		350	339	309	253	84	329	318	308	44
4		267	311	299	282	87	359	308	2	14
5		359	342	357	360	94	345	359	345	353
6		335	326	311	49	80	337	31	329	13
7		313	271	310	50	70	41	131	290	349
8		348	5	322	63	60	40	44	0	2
9		4	355	306	55	78	51	298	349	332
10		69	22	336	56	60	50	354	278	332
11	20	356	272	89	52	69	8	347	301	
12	304	0	12	339	53	70	342	292	1	
13	299	47	0	256	39	70	350	340	322	
14	302	19	322	172	26	63	186	52	22	
15	280	334	13	261	25	45	253	266	235	
16	302	329	161	278	33	42	269	350	217	
17	353	358	253	269	44	43	333	2	263	
18	338	16	350	261	46	61	0	322	123	
19	355	353	16	261	46	66	266	280	20	
20	325	0	11	258	64	56	297	309	281	
21	318	318	358	246	56	57	359	7	320	
22	0	337	345	242	60	324	326	302	351	
23	273	25	296	308	51	353	353	6	24	
24	325	318	349	259	65	339	352	354	12	

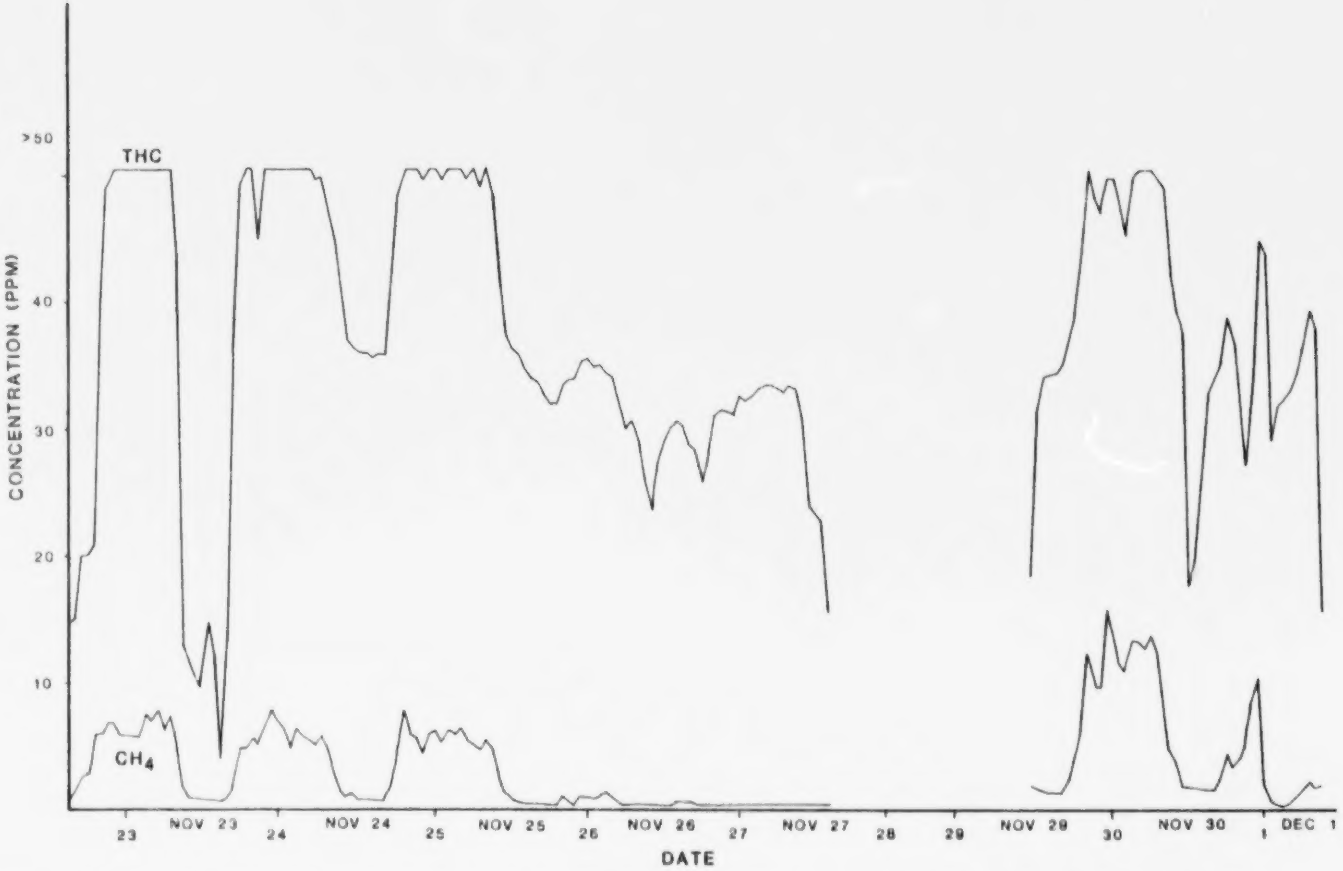


FIGURE IV-1. AMBIENT THC AND CH_4 CONCENTRATIONS AT STATION 034 NEAR WELL 9-X

Table IV- 14

Diurnal Variation of Ozone (ppb)

Trailer 034, Collection Station

Period 12/02/76 to 12/11/76

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		13	12	23	19	25	21	19	34	19
2		14	12	22	17	25	20	22	37	20
3		10	13	17	11	25	16	7	38	21
4		5	10	12	20	24	16	10	35	16
5		4	7	6	25	22	14	12	31	16
6		5	3	12	23	22	13	10	32	14
7		6	3	15	24	21	8	11	29	14
8		8	4	14	16	21	9	6	25	12
9		12	10	18	19	23	14	14	26	10
10		10	12	21	24	27	21	11	30	
11		13	17	25	25	33	26	16	35	
12		20	23	24	28	35	31	22	37	
13	27	21	24	24	35	39	37	25	37	
14	33	28	23	31	39	42	39	34	38	
15	34	29	24	34	43	43	38	35	39	
16	35	27	23	34	42	42	33	33	40	
17	33	19	22	33	32	39	29	31	38	
18	28	22	21	30	27	35	24	29	26	
19	17	24	16	30	23	32	25	26	30	
20	28	24	17	30	25	31	26	27	34	
21	24	25	19	27	27	31	31	29	29	
22	21	26	20	27	26	24	28	33	27	
23	15	14	19	29	26	27	25	23	24	
24	14	8	22	27	26	25	10	30	21	

Table IV-15
Diurnal Variation of Hydrogen Sulfide (ppb)
Trailer 033, Collection Station
Period (12-02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		16	27	3	7	1	14	8	0	15
2		5	36	0	6	21	11	6	0	9
3		6	32	0	6	24	6	7	0	6
4		8	51	0	8	48	2	12	0	7
5		4	37	0	7	42	0	16	0	16
6		15	31	0	6	20	0	10	0	15
7		5	9	0	7	33	0	6	0	14
8		10	3	0	7	30	1	12	8	
9		8	0	0	6	10	8	12	7	
10		0	0	2	3	0	1	4	1	
11		0	9	0	0	0	0	8	0	
12		0	11	6	0	0	0	1	0	
13		0	11	11	0	0	4	0	0	
14		0	0	8	0	0	0	0	0	
15		0	0	7	0	0	2		0	
16		0	0	5	0	0	0		12	
17	0	3	2	7	25	0	22		1	
18	4	17	7	6	21	4	29		10	
19	25	14	4	6	14	3	14	10	19	
20	21	16	2	6	31	14	11	5	11	
21	9	11	1	6	39	6	13	0	25	
22	12	11	1	7	30	0	12	0	19	
23	15	13	0	7	30	7	5	0	9	
24	19	40	2	7	6	12	12	0	5	

Table IV-16

Diurnal Variation of Hydrogen Sulfide (ppb)

Trailer 034, Collection Station

Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		0	0	0	6	3	0	0	0	0
2		0	0	0	4	0	0	10	0	0
3		0	0	3	2	1	0	11	0	5
4		0	0	7	1	0	0	4	3	5
5		1	0	3	1	12	1	0	2	2
6		3	2	0	0	1	4	2	0	4
7		4	4	0	3	1	0	0	0	3
8		1	1	0	4	4	3	3	0	6
9		1	4	0	3	1	14	3	1	3
10		2	1	0	1	4	9	11	0	
11		6	0	1	0	0	3	11	0	
12		1	0	1	0	0	1	2	0	
13	0	1	0	1	0	0	0	1	0	
14	0	0	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	0	
16	0	0	0	2	0	0	0	0	0	
17	0	0	0	4	0	0	0	0	0	
18	0	0	0	10	0	0	0	0	0	
19	0	0	0	2	0	0	0	0	0	
20	0	0	0	0	0	0	0	0	0	
21	0	0	0	2	0	0	0	0	0	
22	0	0	0	5	0	10	0	2	0	
23	0	1	0	1	0	1	2	4	1	
24	0	1	0	6	0	0	4	0	1	

Table IV- 17
Diurnal Variation of Total Hydrocarbons (ppm)
Trailer 033, Collection Station
Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		>50	>50	>50	--	>50	>50	>50	>50	>50
2		>50	>50	>50	--	>50	>50	>50	>50	>50
3		>50	>50	>50	--	>50	>50	>50	>50	>50
4		>50	>50	>50	--	>50	>50	>50	>50	>50
5		>50	>50	>50	--	>50	>50	>50	>50	>50
6		>50	>50	>50	--	>50	>50	>50	>50	>50
7		>50	>50	>50	--	>50	>50	>50	>50	>50
8		>50	>50	>50	--	>50	>50	>50	>50	
9		>50	>50	46.0	--	>50	>50	>50	>50	
10		>50	>50	--	--	>50	>50	>50	>50	
11		34.9	23.8	--	--	>50	>50	>50	39.8	
12		25.6	24.8	--	--	>50	>50	>50	25.5	
13		43.8	27.0	--	--	>50	>50	>50	42.6	
14		>50	45.5	--	--	>50	>50	>50	>50	
15		>50	29.5	--	--	>50	>50	>50	>50	
16	cal	>50	19.8	--	cal	>50	30.9	>50	>50	
17	17.8	>50	39.5	--	29.3	>50	38.2	>50	>50	
18	27.1	>50	43.4	--	28.3	>50	>50	>50	>50	
19	49.8	>50	>50	--	41.5	>50	>50	>50	>50	
20	>50	>50	>50	--	>50	>50	>50	>50	>50	
21	>50	>50	>50	--	>50	>50	>50	>50	>50	
22	>50	>50	>50	--	>50	>50	>50	>50	>50	
23	>50	>50	>50	--	>50	>50	>50	>50	>50	
24	>50	>50	>50	--	>50	>50	>50	>50	>50	

Table IV-18
Diurnal Variation of Methane (ppm)
Trailer 033, Collection Station
Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		3.2	3.6	1.3	--	0.9	1.7	1.7	0.8	2.3
2		1.8	4.3	0.9	--	1.8	1.7	1.7	0.7	2.2
3		1.7	3.8	0.8	--	1.8	1.6	1.7	0.7	2.1
4		2.1	6.1	1.1	--	3.2	1.5	1.9	0.6	2.1
5		1.6	4.9	1.3	--	3.5	1.4	2.3	0.7	2.4
6		2.6	4.3	1.0	--	2.9	1.4	2.1	1.1	2.4
7		1.6	2.2	0.7	--	2.1	1.5	2.0	1.2	2.4
8		2.0	1.6	1.2	--	2.2	1.5	2.0	1.6	
9		1.9	2.0	1.7	--	2.3	1.8	2.1	1.8	
10		1.0	1.0	1.3	--	1.3	1.6	1.8	1.6	
11		0.9	0.7	--	--	0.8	1.1	1.2	1.1	
12		0.7	0.5	--	--	0.5	0.6	0.9	0.6	
13		0.6	0.5	--	--	0.4	0.4	0.8	0.5	
14		0.5	0.6	--	--	0.4	0.4	0.7	0.5	
15		0.5	0.5	--	--	0.4	0.4	0.6	0.8	
16		0.5	0.5	--	--	0.4	1.5	0.6	0.6	
17		1.4	1.1	--	3.1	0.7	1.8	0.6	0.6	
18	0.8	2.3	1.8	--	2.3	0.7	0.8	1.1	1.0	
19	1.7	1.4	1.9	--	1.9	0.8	0.9	0.9	1.2	
20	1.5	1.5	1.5	--	2.7	1.2	1.1	1.0	1.2	
21	1.4	1.4	1.1	--	3.1	1.1	1.2	0.9	1.9	
22	2.3	1.4	0.8	--	2.6	1.0	1.3	0.8	2.1	
23	3.0	2.1	0.9	--	2.5	1.3	1.2	0.8	1.9	
24	3.2	4.5	1.4	--	1.5	1.4	1.5	0.9	1.9	

Table IV-19

Diurnal Variation of Total Hydrocarbons (ppm)

Trailer 034, Collection Station

Period (12/02/76 to 12/11/76)

HOUR	DAY									
	2	3	4	5	6	7	8	9	10	11
1		2.3	5.3	3.7	11	6.7	4.5	4.2	3.9	4.2
2		1.8	5.0	4.1	6.0	4.0	4.3	6.8	3.8	3.9
3		1.8	4.2	7.2	6.3	4.2	4.0	6.2	4.3	6.2
4			4.8	11	6.3	4.1	4.1	5.1	5.6	6.8
5			4.7	11	4.8	8.6	4.3	4.4	5.6	4.9
6			7.0	6.4	5.2	4.8	4.6	4.9	3.9	18
7			8.7	5.3	5.8	4.3	4.7	4.2	3.8	48
8			6.5	4.8	8.0	5.1	5.4	5.0	4.3	45
9			8.4	4.2	6.2	4.9	6.7	4.5	5.3	43
10			5.5	4.1	5.4	6.0	6.0	8.9	4.4	
11		2.2	5.7	5.4	4.7	4.3	5.3	7.4	4.2	
12		7.8	4.1	6.4	4.6	4.4	4.8	5.1	3.8	
13		4.9	4.6	6.2	3.9	4.0	3.7	5.0	3.6	
14	1.8	4.4	4.5	4.3	3.6	3.4	3.3	3.6	3.6	
15	4.2	4.8	3.8	3.7	3.2	3.3	3.4	3.5	3.5	
16	3.0	4.6	3.6	4.5	3.5	3.4	3.5	3.8	3.4	
17		4.4	3.6	4.9	3.3	3.3	3.6	3.6	3.5	
18	4.1	3.9	3.5	5.7	3.4	3.4	3.7	3.6	3.4	
19	4.9	3.9	4.1	4.8	3.5	3.6	3.7	3.8	3.4	
20	1.5	4.0	3.7	3.9	3.6	3.4	3.6	3.8	3.5	
21	1.6	4.0	3.7	8.3	3.7	3.6	3.4	3.8	3.7	
22	1.8	4.3	3.7	7.3	3.8	7.6	3.5	3.9	3.9	
23	2.1	5.4	3.8	4.6	3.6	4.5	4.3	6.6	4.4	
24	2.1	6.2	3.8	9.2	3.6	3.8	6.7	4.7	4.3	

Table IV-20
Diurnal Variation of Methane (ppm)
Trailer 034, Collection Station
Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		1.3	1.3	1.1	1.7	1.3	1.1	1.0	1.0	1.0
2			1.3	1.1	1.3	1.0	1.1	1.2	1.0	1.0
3			1.2	1.4	1.4	1.0	1.0	1.2	1.0	1.3
4			1.2	1.7	1.4	1.0	1.1	1.1	1.2	1.4
5			1.2	1.9	1.2	1.5	1.1	1.1	1.2	1.1
6			1.4	1.4	1.2	1.1	1.1	1.1	1.0	1.2
7			1.6	1.3	1.2	1.0	1.1	1.1	1.0	0.4
8			1.4	1.2	1.5	1.1	1.2	1.2	1.0	0.4
9			1.8	1.1	1.3	1.0	1.3	1.1	1.2	0.4
10			1.3	1.1	1.2	1.2	1.2	1.4	1.1	
11			1.2	1.3	1.1	1.0	1.2	1.3	1.0	
12		1.4	1.1	1.3	1.1	1.0	1.0	1.1	1.0	
13	3.5	1.2	1.2	1.4	1.1	1.0	1.0	1.2	1.0	
14	0.8	1.1	1.2	1.1	1.0	0.9	0.9	1.0	1.0	
15	0.8	1.1	1.1	1.0	0.9	0.9	0.9	1.0	0.9	
16		1.1	1.0	1.0	1.0	0.9	0.9	1.0	1.0	
17	1.2	1.1	1.0	1.1	0.9	0.9	1.0	1.0	0.9	
18	1.3	1.1	1.0	1.2	1.0	0.9	1.0	1.0	0.9	
19		1.1	1.1	1.2	1.0	1.0	1.0	1.0	0.9	
20		1.1	1.0	1.1	1.0	1.0	1.0	1.0	1.0	
21		1.1	1.0	1.2	1.1	1.0	1.0	1.0	1.0	
22		1.2	1.1	1.6	1.0	1.3	1.0	1.0	1.0	
23		1.3	1.1	1.2	1.0	1.1	1.1	1.3	1.0	
24		1.4	1.1	1.4	1.0	1.0	1.3	1.1	1.0	

Table IV-21

Diurnal Variation of Wind Speed (mph)
Trailer 033, Collection Station
Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		1	1	5	0	1	1	1	2	0
2		1	2	1	1	2	1	1	2	0
3		1	1	1	0	1	3	1	4	0
4		0	0	2	1	1	1	0	2	0
5		0	0	2	3	0	0	1	2	0
6		0	1	1	0	0	0	0	2	0
7		0	2	2	1	0	0	0	2	0
8		0	0	1	1	0	0	1	0	
9		0	1	1	0	1	1	0	1	
10		1	2	3	1	1	2	0	2	
11		1	1	1	1	1	1	0	3	
12		1	0	1	0	0	0	5	3	
13		2	3	2	2	2	0	3	4	
14		1	1	5	2	3	2	5	3	
15		1	4	6	2	5	4	7	5	
16		1	4	8	1	-	7	5	6	
17	4	1	5	7	1	3	7	5	5	
18	6	6	5	4	1	4	4	7	5	
19	7	10	3	4	0	2	1	7	5	
20	4	8	4	6	1	3	2	3	2	
21	1	6	8	3	0	0	5	4	1	
22	1	2	7	1	1	0	4	6	1	
23	0	0	3	1	1	1	0	3	1	
24	0	0	5	1	2	0	0	1	0	

Table IV-22
Diurnal Variation of Wind Speed (mph)
Trailer 034, Collection Station
Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		1	1	6	2	1	1	2	3	0
2		1	2	2	3	2	1	1	3	0
3		1	1	1	3	1	3	1	5	1
4		0	0	2	3	1	2	1	3	1
5		0	0	3	4	1	0	1	2	0
6		1	1	3	2	1	0	1	2	1
7		0	2	2	3	1	0	1	2	0
8		0	0	1	2	1	0	1	1	1
9		0	1	3	2	1	1	1	1	0
10		1	3	4	3	1	2	0	3	
11		1	2	2	3	2	2	1	3	
12		2	1	3	2	2	2	7	4	
13	4	2	4	4	4	4	1	4	5	
14	4	1	2	7	3	4	3	6	4	
15	6	2	6	8	3	5	5	8	6	
16	7	2	6	10	2	3	8	5	7	
17	7	1	5	8	1	3	8	7	7	
18	8	6	5	5	1	5	6	7	6	
19	10	9	3	6	1	3	2	6	5	
20	5	8	5	8	1	4	3	4	3	
21	1	6	8	5	0	1	6	5	1	
22	1	4	8	3	1	2	5	7	1	
23	0	0	5	3	1	3	1	4	1	
24	0	0	6	3	2	1	1	1	0	

TABLE IV-23
Diurnal Variation of Wind Direction
Trailer 033, Collection Station
Period (12/02/76 to 12/11/76)

	DAY								
HOUR	2	3	4	5	6	7	8	9	10	11
1		242	240	260	70	138	225	253	149	182
2		251	213	275	87	247	254	137	160	220
3		293	192	24	38	228	253	220	151	91
4		244	232	9	69	225	241	265	110	187
5		207	230	29	58	185	224	250	218	226
6		196	150	19	118	215	248	212	237	110
7		167	47	100	106	208	234	203	229	246
8		217	276	232	78	239	195	239	201	
9		181	148	245	127	216	119	188	250	
10		105	98	276	90	145	103	188	163	
11		108	103	47	24	104	91	123	134	
12		91	163	84	112	123	82	216	142	
13		96	89	117	112	158	109	166	167	
14		102	165	115	122	221	223	215	175	
15		100	221	52	206	244	232	233	213	
16		113	230	61	172	--	229	250	204	
17	229	220	249	65	190	266	236	221	232	
18	245	248	260	45	199	231	254	261	252	
19	246	255	198	46	214	263	250	252	253	
20	247	256	239	22	206	246	249	293	269	
21	244	261	239	73	193	200	247	266	242	
22	297	241	251	44	233	323	244	317	236	
23	232	277	249	99	233	249	220	137	237	
24	230	225	259	74	312	223	312	177	201	

TABLE IV-24
Diurnal Variation of Wind Direction
Trailer 034, Collection Station
Period (12/02/76 to 12/11/76)

	DAY								
HOUR	2	3	4	5	6	7	8	9	10	11
1		309	317	278	52	92	288	286	164	320
2		295	314	321	70	286	306	350	156	298
3		339	335	347	40	316	275	316	153	44
4		331	353	348	80	294	310	317	99	4
5		317	319	43	73	344	325	302	327	353
6		343	13	35	96	328	319	334	272	13
7		331	41	64	88	345	325	301	274	349
8		317	341	307	30	314	345	310	347	2
9		342	11	267	45	332	49	355	304	332
10		60	93	287	89	74	62	347	177	
11		68	88	35	68	74	88	30	134	
12		79	353	59	38	66	56	222	138	
13	88	66	69	120	128	187	55	322	167	
14	320	95	318	121	82	229	241	238	174	
15	221	92	231	60	246	245	247	243	218	
16	223	125	243	69	176	257	237	260	212	
17	236	260	264	73	256	278	241	228	237	
18	254	252	276	50	290	246	262	275	260	
19	256	272	192	51	301	283	279	271	265	
20	265	261	248	34	330	255	283	307	296	
21	282	272	252	74	358	289	258	288	321	
22	313	275	267	54	301	321	235	320	321	
23	328	339	271	92	286	285	323	140	287	
24	328	339	271	92	286	285	323	140	287	

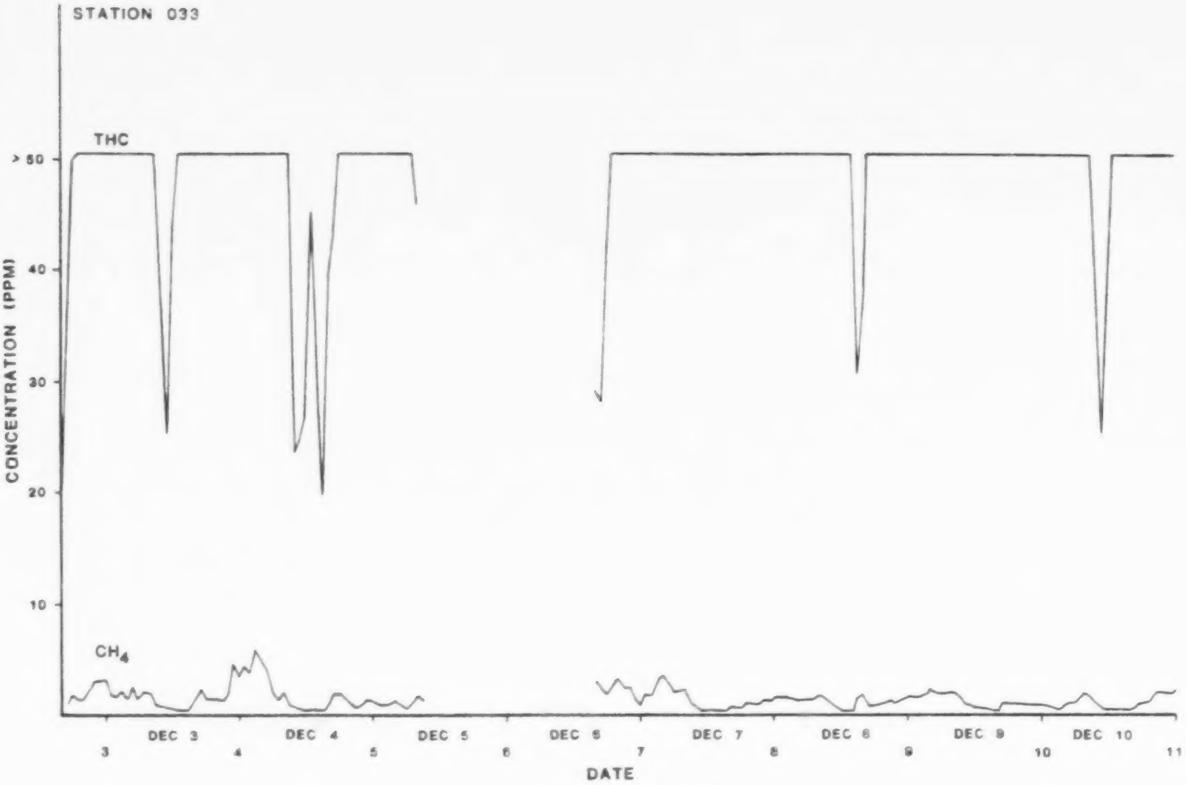


FIGURE IV-2
AMBIENT THC AND CH_4 CONCENTRATION AT STATION 033 EAST OF COLLECTION STATION

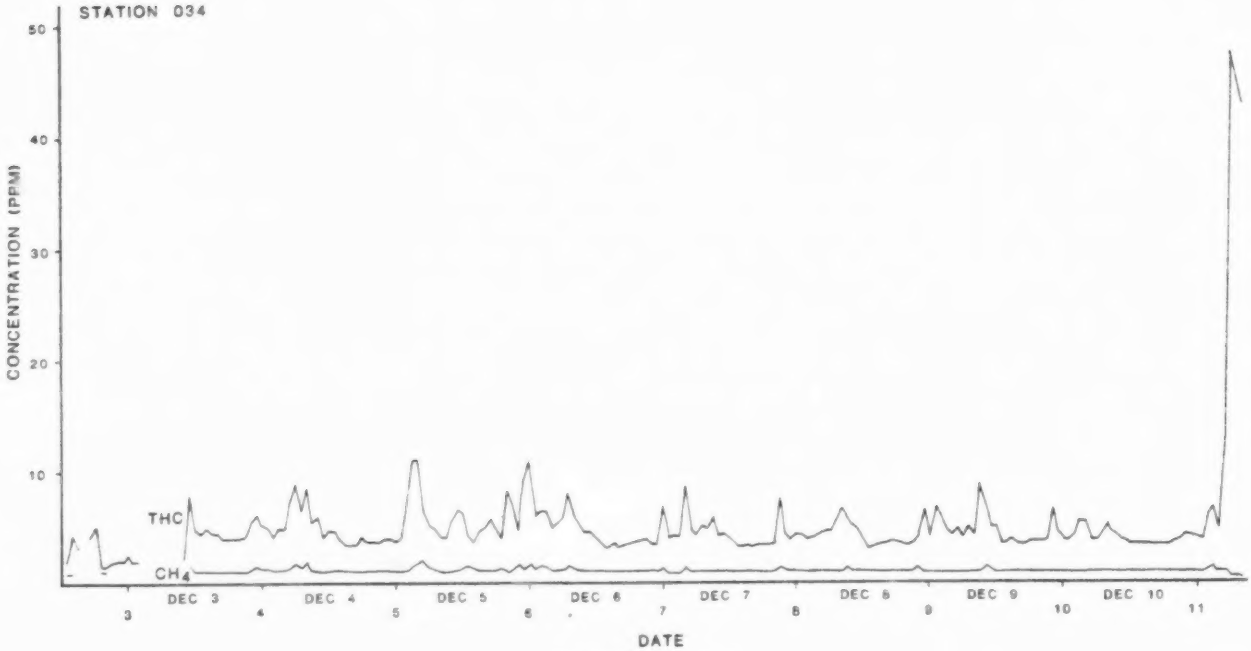


FIGURE IV-3
AMBIENT THC AND CH_4 CONCENTRATIONS AT STATION 034 WEST OF COLLECTION STATION

V. DISCUSSION

A number of fugitive emissions were identified ranging from minute to jet-type leaks. Less than ten percent of the potential sources of emissions were leaking, and although there were several large leaks, most leaks were minute. The most prevalent leaks were associated with valves; flanges and other types of connectors did not make significant contributions to the overall leak rate. The total number of sites and types of units that were inspected were necessarily limited in this survey program. Other possible sources of fugitive emissions such as treaters, sumps, oil spills, large open vessels, open pits, etc. were identified but were outside the scope of the program.

There are many potential leaks in an oil and gas field. These leaks may be caused by temperature, pressure, vibration, friction, variable operating conditions, and corrosion. The extent of these emissions and the degree of hazard or impact are generally determined by the maintenance level in the area of interest. Maintenance is the key to reducing losses due to most fugitive emissions. The quality of maintenance in any industrial area is a variable but significant factor. Fugitive emissions are inevitable in a production facility subject to pressure and stress, but effective maintenance can minimize the effect of such emissions. Relatively few leaks were identified at the Rangely field, and these were generally small. However, as seen in Table IV-3, a large leak can contribute significant emissions. The hydrocarbon emission rate per well ranged from zero to 23.4 pounds per day. The emission factors for these sites varied from zero to 0.717 pounds per barrel of oil produced. The variation in the emission rates and factors indicate that the quantity of fugitive emissions is not related to production rate but is instead a function of maintenance and the speed with which leaks can be identified and repaired.

Only a few sites were sampled because this program was a general study to survey the types of fugitive emissions in a producing oil and gas field, to develop sampling and monitoring procedures, and to obtain an indication of the effects of fugitive emissions on air quality. Therefore, emission rates and emission factors for the entire field were not extrapolated because of the limited statistical base. However, the detection of several large sources of fugitive emissions combined with the monitoring results show that fugitive emissions influence the air quality in the vicinity of the field.

The emissions from the oil and gas field did have an impact on the air quality of the immediate area, particularly with respect to hydrogen sulfide and hydrocarbons. The contributions of the emissions are most evident in the high concentrations of these two species. No significant sources of emissions other than fugitive emissions were evident at the time of the study.

The concentrations of hydrogen sulfide were highest near the collection station where the monitor was subject to the station as well as nearby producing wells. The hydrogen sulfide levels were episodic; that is, the levels would be below the detection limits of the monitor, rise to a peak value, and then fall below detection limits. During the monitoring near the collection station the increase in H_2S levels coincided with increased wind speeds.

The total hydrocarbon levels were as high as 50 ppm at both the northwestern and southeastern monitoring sites. High hydrocarbon levels would, of course, be expected on the site of a facility such as an oil and gas field. The major contribution to the high hydrocarbon levels came from nonmethane hydrocarbons. Longer-term monitoring would be required to determine if the recorded levels are persistent or are a short-term phenomenon. There are several relevant aspects of these readings.

First, the large concentrations of nonmethane hydrocarbons are influenced by the higher density of the heavier hydrocarbons causing a possible concentration gradient with the nonmethane hydrocarbons being more concentrated than methane near ground level. This effect would be more pronounced during the cold periods when the monitoring occurred.

Secondly, the total hydrocarbon readings are expressed on the basis of methane response. A gas such as propane will give a reading approximately three times as high as methane for the same volume concentration. Flame ionization detectors such as the one used in this study are coming under intense scrutiny due to substantially discrepant nonmethane hydrocarbon measurements from various types of hydrocarbon analyzers measuring identical samples of ambient air. Substantial discrepancies can arise using different models of such analyzers. Therefore, ambient nonmethane hydrocarbon measurements can only be used as possible guidelines and should not be taken as exact values. An uncertainity in the ambient hydrocarbon measurements cannot be assigned, but the uncertainity in other measurements in this study is within ± 20 percent.

The upwind/downwind results of monitoring at the two sites produced different results. The only significant upwind/downwind differences were for H_2S and total hydrocarbon at the northwest site. The monitoring at Well 9-X did not produce a significant difference in upwind and downwind values. The single source of emissions between the two stations was not large enough to produce a detectable difference, and the measurements were due to the total emissions upwind of the two stations.

These two stations were downwind of the major portion of the oil field leading to large hydrocarbon measurements at both stations.

Measurements taken near the collection station on the northwest perimeter of the field showed more upwind/downwind variations. Trailer 034, which was the western monitoring site, recorded minimum background levels because of the prevailing wind directions, terrain, absence of producing sites upwind from it, and its location closer to the edge of the field. This site monitored lower levels of both H_2S and THC than Trailer 033 which was east of the collection station and subject to the influences of other facilities as well as the collection station. Table V-1 gives the diurnal variation in the difference between the H_2S readings at stations 033 and 034. The average difference on an hourly basis is shown in Figure V-1. The difference in the total hydrocarbon readings is given in Table V-2. When the wind was from the west or northwest the outer station, 033, measured minimum levels and provided a background measurement with which to reference the higher levels seen at the other monitoring station.

Although the oil and gas emissions do influence the immediate air quality in the vicinity of the oil field, the air quality monitored by other nearby networks recorded the types of low level pollutant concentrations associated with remote areas. Summaries of the air quality parameters for the three federal oil shale leasing tracts are given in Tables V-3, V-4, V-5, and V-6. The concentrations of all pollutants at the three oil shale monitoring areas are background levels with no episodes of high levels. Measurement of H_2S, SO_2, and oxides of nitrogen were at the minimum detectable limits of the analyzers. Measurements at the tracts indicated no undue amounts of hydrocarbons. There were no variations at the oil shale tracts corresponding to the high levels recorded at Rangely and subsequently no indication of long-range transport of these pollutants.

TABLE V-1

Diurnal Variation of Difference in H_2S Levels Between Station 033 and 034 Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		16	27	3	1	-2	14	8	0	15
2		5	36	0	2	21	11	-4	0	9
3		6	32	-3	4	23	6	-4	0	1
4		8	51	-7	7	48	2	8	-3	2
5		3	37	-3	6	30	-1	16	-2	14
6		12	29	0	6	19	-4	8	0	11
7		1	5	0	4	32	0	6	0	11
8		9	2	0	3	26	-2	9	8	
9		7	-4	0	3	9	-6	9	6	
10		-2	-1	2	2	-4	-8	-7	1	
11		-6	9	-1	0	0	-3	-3	0	
12		-1	11	5	0	0	-1	-1	0	
13		-1	11	10	0	0	4	-1	0	
14		0	0	8	0	0	0	0	0	
15		0	0	7	0	0	2		0	
16		0	0	3	0	0	0		12	
17		3	2	3	23	0	22		1	
18	4	17	7	-4	21	4	29		10	
19	25	14	4	4	14	3	14	10	19	
20	21	16	2	6	31	14	11	5	11	
21	9	11	1	4	39	6	13	0	25	
22	12	11	1	2	30	-10	12	-2	19	
23	15	12	0	6	30	6	3	-4	8	
24	19	39	2	1	6	12	8	0	4	

NOTE: Values calculated as 033-034.

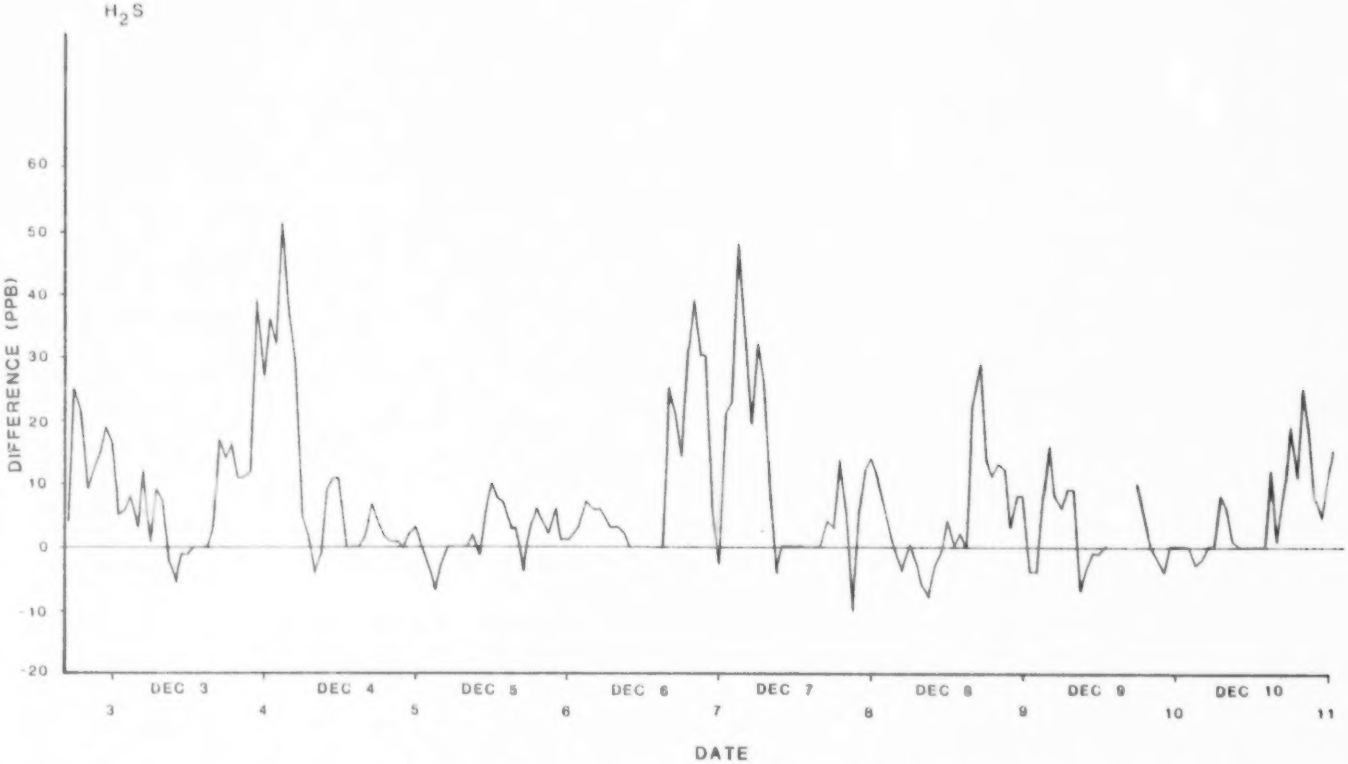


FIGURE V-1. DIFFERENCE IN H_2S LEVELS AT STATIONS 033 AND 034 NEAR COLLECTION STATION

TABLE V-2

Diurnal Variation of Differences in THC Measurements at 033 and 034 Period (12/02/76 to 12/11/76)

	DAY									
HOUR	2	3	4	5	6	7	8	9	10	11
1		>48	>45	>46		>43	>46	>46	>46	>45
2		>48	>45	>46		>46	>46	>43	>46	>46
3		>48	>46	>43		>46	>46	>44	>46	>44
4			>45	>39		>46	>46	>45	>44	>43
5			>45	>39		>41	>46	>46	>44	>45
6			>43	>44		>45	>45	>45	>46	>32
7			>41	>45		>46	>45	>46	>46	> 2
8			>44	>45		>45	>44	>45	>46	> 5
9			>42	>42		>45	>43	>35	>45	>27
10			>45			>44	>44	>41	>46	
11			18			>46	>45	>43	36	
12			21			>46	>45	>45	22	
13			22			>46	>46	>45	39	
14			41			>47	>46	>46	>46	
15			26			>47	>46	>47	>47	
16			16			>47	27	>46	>47	
17			36		26	>47	34	>46	>47	
18	23		40		25	>47	>46	>46	>47	
19	45		>46		38	>46	>46	>46	>47	
20	>49		>46		>46	>47	>46	>46	>47	
21	>48		>46		>46	>46	>47	>46	>46	
22	>48		>46		>46	>42	>47	>46	>46	
23	>48		>46		>46	>46	>46	>43	>46	
24	>48		>46		>46	>46	>43	>45	>46	

NOTE: Calculated as 033 level - 034 level.

TABLE V-3

MONTHLY SUMMARY OF AIR QUALITY PARAMETERS

RIO BLANCO OIL SHALE PROJECT

November, 1976

Parameter	Minimum ppm	Maximum ppm	Arithmetic Mean
SITE 1			
O_3	0.024	0.039	0.033
CO	0.000	0.971	0.062
NO	0.004	0.013	0.010
NO_x	0.002	0.012	0.009
CH_4	1.305	1.970	1.602
THC	1.429	1.936	1.788
H_2S	0.000	0.014	0.001
SO_2	0.000	0.000	0.000
SITE 2			
CH_4	1.375	1.565	1.461
THC	1.380	1.819	1.488
H_2S	0.001	0.013	0.003
SO_2	0.001	0.008	0.001
SITE 3			
O_3	0.010	0.042	0.026
CO	0.000	1.281	0.541
NO	0.001	0.022	0.005
NO_x	0.000	0.019	0.003
CH_4	1.314	1.599	1.484
THC	1.398	1.635	1.505
H_2S	0.002	0.010	0.003
SO_2	0.001	0.009	0.002
SITE 4			
CH_4	1.319	1.459	1.644
THC	1.339	1.700	1.504
H_2S	0.001	0.021	0.002
SO_2	0.000	0.024	0.001

All values are expressed in ppm and are based upon hourly averages.

TABLE V-4

MONTHLY SUMMARY OF AIR QUALITY PARAMETERS
RIO BLANCO OIL SHALE PROJECT
December, 1976

Parameter	Minimum ppm	Maximum ppm	Mean
O_3	0.013	0.043	0.026
CO	0.000	0.681	0.218
NO	0.000	0.011	0.003
NO_x	0.000	0.010	0.004
CH_4	1.361	1.667	1.470
THC	1.385	1.810	1.500
H_2S	0.002	0.004	0.003
SO_2	0.001	0.004	0.002

All values are based on hourly averages and are expressed in ppm.

TABLE V-5

MONTHLY SUMMARY OF AIR QUALITY PARAMETERS

WHITE RIVER SHALE PROJECT

November and December, 1976

Parameter	Minimum ppm	Maximum ppm	Mean
O_3	0.010	0.041	0.024
Total Sulfur	0.000	0.001	0.000
NO_x	0.001	0.012	0.005
CO	0.000	1.0	0.1
CH_4	1.4	7.3	1.6
THC	1.4	8.7	1.7

December, 1976

Parameter	Minimum ppm	Maximum ppm	Mean
O_3	0.015	0.062	0.033
Total Sulfur	0.000	0.002	0.000
NO_x	0.001	0.021	0.007
CO	0.100	1.0	0.200
CH_4	1.6	2.7	1.7
THC	1.5	2.7	1.8

All values are based on hourly averages and are expressed in ppm.

TABLE V-6

MONTHLY SUMMARIES OF AIR QUALITY PARAMETERS

TRACT C-b OIL SHALE PROJECT

NOVEMBER AND DECEMBER, 1976

Parameter	Minimum ppm	Maximum ppm	Mean
	November		
O_3	0.021	0.058	0.040
NO_x	*	0.050	0.004
H_2S	*	0.007	0.001
SO_2	*	0.006	0.001
CO	0.12	1.3	0.31
CH_4	1.4	1.7	1.5
THC	1.5	3.3	1.7
	December		
O_3	0.022	0.047	0.034
NO_x	*	0.030	0.002
H_2S	*	0.008	0
SO_2	*	0.001	*
CO	0.10	0.96	0.38
CH_4	1.2	2.0	1.5
THC	1.3	4.2	1.6

*Below minimum detection limit.
All values are based on hourly averages and are expressed in ppm.

Meteorological summaries and monitoring results for the oil shale tracts are given in the appendices.

VI. SUMMARY

The following list summarizes the findings of this program:

1) Techniques for fugitive emission sampling were tested and proven.

2) Leaks were detected in 9.7 percent of the units checked.

3) Both rates and composition were determined for the fugitive emissions.

4) Emission rates varied from zero to 23.4 pounds per day per site, and emission factors varied from zero to 0.717 pounds per barrel of oil.

5) Unlike processing facilities which are usually tested for fugitive emissions, leak rates for some sites in the oil field were variable.

6) Maintenance is the key to reducing losses from fugitive emissions.

7) Ambient air quality detected high concentrations of H_2S and total hydrocarbons, indicating the influence of fugitive emissions on the air quality in the vicinity of the oil and gas field.

8) Upwind/downwind monitoring at the northwest site provided background versus oil field measurements that show the effects of oil field emissions on ambient air quality.

9) The total hydrocarbon concentration in the ambient air was high, and the major constituents were non-methane hydrocarbons. The indicated high levels of NMHC were due to the FID measurement technique and the suspected settling of the denser hydrocarbons causing a concentration gradient.

10) No high levels of pollutants were detected at any of the surrounding monitoring networks which would correspond to the levels at the oil field. There were no indications of long-range transport.

APPENDIX A

METEOROLOGICAL SUMMARIES

Monthly Meteorological Summary

A. Summary of the Meteorological Conditions in Northwestern and West Central Colorado During November 1976

Grand Junction, Colorado, sixty miles to the south-southwest of the Tract C-b, received a total of 0.04 inch of precipitation during November, which is 0.57 inch below the monthly normal of 0.61 inch. Grand Junction also received a trace of snow during November. Measurable precipitation (≥.01 inch) was recorded only on November 14th. The region received 79 percent of the possible monthly sunshine. Sky cover by cloudiness averaged 4.3 out of a possible 10 during the daylight hours and 3.6 out of a possible 10 during the entire month. The region had thirteen clear days, eleven partly cloudy days, and six cloudy days during the month.

Air mass changes occurred in the region with a frequency of about once every five or six days during November. Temperatures were cool but near seasonal normals. Transport winds were not as strong as those which prevailed in the area during October. Five cold fronts, all of continental polar origins, passed through the region during October. These continental polar cold frontal passages occurred on November 2nd, 6th, 16th, 21st, and 26th.

B. Summary of the Meteorological Conditions in the Oil Shale Tract C-b Region During November 1976

An upper-level ridge which had a mean position over western Colorado was responsible for the below normal precipitation totals which occurred during November. The Tract C-b region was located on the downstream side of an upper-level ridge in the western United States. As a result, very little troughing occurred in the Tract C-b region during November. The only precipitation which occurred fell on the 13th and 14th. Since the long wave trough was located in the eastern section of the country, most of the continental polar air masses were directed toward the eastern half of the United States. Therefore, temperatures in the Tract C-b region were near normal during November.

Five continental polar cold frontal passages occurred during the month. These fronts were fairly mild since the major thrust of the cold air was to the east of the region.

The monthly average temperatures recorded at the meteorological tower during November were: 34.4°F at 8 feet; 34.2°F at 30 feet; 34.6°F at 100 feet; and 32.9°F at 200 feet. These averages are approximately 9F° lower than those recorded in October. The warmest days of the month were the 1st through the 10th. The coolest days were the 26th through the 29th. The highest temperature recorded at the meteorological tower during November was 61°F at the 8-foot level on the 5th. The coldest temperature recorded at the meteorological tower was -7°F at the 200-foot level on the morning of the 27th.

Monthly average relative humidities during November were slightly higher than they had been in October in the Tract C-b region. This increase can be attributed solely to the decrease in monthly average temperatures which occurred during November. The average moisture content of the air in the district actually decreased during the month. At the meteorological tower, the monthly average relative humidities were: 52.5 percent at 8 feet, 55.7 percent at 30 feet, 57.0 percent at 100 feet, and 54.8 percent at 200 feet. These relative humidities correspond to dew points of 19°F, 20°F, 21°F, and 18°F, respectively. The most humid days of the month were the 14th, 15th, and 26th. The driest days were the 6th, 9th, and 10th.

Winds at the meteorological tower during November were not as strong on the average as the winds that prevailed during October because of the lack of short waves moving through the Tract C-b region. Resultant wind vectors at the meteorological tower during November were: 236.5 degrees at 0.9 miles per hour at 8 feet; 237.4 degrees at 1.2 miles per hour at 30 feet; 249.3 degrees at 1.4 miles per hour at 100 feet; and 255.2 degrees at 2.1 miles per hour at 200 feet. The scalar average wind speeds associated with these resultant wind vectors were 3, 4, 5, and 6 miles per hour, respectively. The Ekman spiral and Ekman effect, i.e., a veering in direction and increase in speed as a function of increasing height above the surface, were in evidence during most of November. A reference to the November wind roses for the meteorological tower indicates that the winds at that location were primarily south-southwesterly at all four levels, with a relatively high frequency of occurrence of southwesterly winds in addition.

The windiest days of the month at the meteorological tower were the 14th, 25th, and 26th. The days having the lightest winds were the 1st, 2nd, 5th, 7th, 9th, 17th, 18th, 19th, 21st, and 23rd. The highest five-minute average wind speed recorded at the tower during November was 28 miles per hour at the 200-foot level on the 25th and 26th.

Precipitation totals in the Tract C-b Monitoring Network during November were generally very much below normal. Only 0.04 inch of precipitation was recorded at the meteorological tower during November. The largest daily precipitation total recorded in the network during November was 0.03 inch on November 13th. The greatest five-minute precipitation total recorded during the month was 0.01 inch (a precipitation rate of 0.12 inch/hour), recorded on the 13th and 14th. Measurable precipitation (≥.01 inch) was recorded at the meteorological tower on only two days of the month. The precipitation on these days was in the form of snow.

The monthly average station pressure during November was 791.9 millibars at the meteorological tower. This reading is 0.3 millibar higher than the October average station pressure of 791.6 millibars. The highest daily average station pressures occurred on the 1st, 2nd, 3rd, 4th, 7th, 8th, and 17th. The lowest daily average station pressures occurred on the 25th and 26th.

Cloudiness increased slightly in the Tract C-b region during November, compared to the October cloud cover and insolation statistics. The region received an insolation total of 6711.9 langleys, which is equivalent to a daily average insolation total of 224 langleys/day. This average is only slightly below the normal for November of 250 langleys/day in the Tract C-b region. On a diurnal basis, the greatest solar radiation rates occurred between 1100 and 1200 hours. The greatest daily radiation totals were received on the 1st, 4th, and 15th. The lowest daily solar radiation totals were received on the 13th, 14th, and 26th. The greatest five-minute radiation total received during November was 5.20 langleys (a rate of 1.04 langleys/minute), which occurred on the 3rd. The largest hourly insolation total received during November was 54 langleys, which occurred on the 15th between 1100 and 1200 hours. Because of the progressively decreasing solar elevations and the increasingly shorter periods of daylight that prevailed during November, the total possible solar radiation which could be received during a day decreased monotonically throughout the month.

The slight increase in cloudiness and decrease in insolation which affected the Tract C-b during November caused the unstable stability classes to become less common than they had been in October. Using the Pasquill method of stability determination, "C" stability (slightly unstable) was the most common stability, occurring during 185 daytime hours, or 62.5 percent of the time. In decreasing order of frequency, "D" (neutral) stability occurred during 59 hours, or 19.9 percent of the time, and "B" (very unstable) stability occurred during 52 hours, or 17.6 percent of the time. "A" (extremely unstable) stability did not occur.

Monthly Meteorological Summary

A. Summary of the Meteorological Conditions in Northwestern and West Central Colorado During December 1976

Grand Junction, Colorado, sixty miles to the south-southwest of the Tract C-b, received a total of only 0.01 inch of precipitation during December, which is 0.54 inch below the monthly normal of 0.55 inch. According to the National Weather Service Office in Grand Junction: "This is the 2nd driest December of record. The driest was 1900 with a trace." Grand Junction received 0.1 inch of snow during December. Measurable precipitation (≥.01 inch) occurred on December 5th. The region received 84 percent of the possible monthly sunshine. Sky cover by cloudiness averaged 3.8 out of a possible 10 during the daylight hours and 3.3 out of a possible 10 during the entire month. The region had seventeen clear days, six partly cloudy days, and eight cloudy days during the month.

Air mass changes were infrequent during December. Only two frontal passages occurred during December, which is far below average. This decrease in cold frontal passages was due to the presence of an upper-level ridge over the western United States for most of December. Temperatures in the Tract C-b were cool due to seasonal influences. Transport winds were slightly stronger than those which prevailed during November. A maritime polar cold frontal passage occurred on the 9th and a continental polar cold frontal passage occurred on the 12th.

B. Summary of the Meteorological Conditions in the Oil Shale Tract C-b Region During December 1976

An upper-level ridge over the western United States was responsible for the below-normal precipitation totals and slightly below normal average temperatures which occurred during December. Since a long wave trough was located in the eastern United States, most of the continental polar outbreaks during the month were directed to the east of the Tract C-b into the eastern sections of the country. In addition, the long wave ridge in the western United States prevented most Pacific (maritime polar) fronts from penetrating the western United States. No precipitation occurred in the Tract C-b area during December. Slightly below normal temperatures affected the Tract C-b area, a reflection of the cold air which often stagnates in the Great Basin during the winter months.

A maritime polar cold frontal passage occurred on December 9th and a continental polar cold frontal passage occurred on December 12th. These fronts were fairly mild since the major thrust of the cold air was to the eastern half of the United States.

The monthly average temperatures recorded at the meteorological tower during December were 27.4°F at 8 feet; 26.0°F at 30 feet; 27.2°F at 100 feet; and 25.6°F at 200 feet. These averages are approximately 7F° lower than those recorded in November. The warmest days of the month at the meteorological tower were the 2nd, 3rd, 4th, 8th, 9th, 13th, 17th, and 18th. The coolest days were the 6th and 25th. The highest temperature recorded at the meteorological tower during December was 49°F at the 8-foot level on the 17th. The coldest temperature recorded at the meteorological tower was 8°F at the 8- and 30-foot levels on the morning of the 25th. This reading also occurred at the 30-foot level on the morning of the 6th.

Monthly average relative humidities during December were nearly the same as those that prevailed during November. Therefore, since average temperatures were lower in December than in November, the average moisture content of the air was slightly lower during December (in order to maintain the same average relative humidity). At the meteorological tower, the monthly average relative humidities were 52.7 percent at 8 feet; 57.4 percent at 100 feet; and 53.3 percent at 200 feet. These relative humidites correspond to dew points of 12.5°F, 13°F, and 12°F, respectively. The relative humidity sensor at the 30-foot level was inoperative for most of the month. The most humid days of the month were the 1st, 5th, 6th, 10th, and 31st. The driest days were the 16th, 17th, and 18th.

Winds at the meteorological tower during December were only slighly stronger than the winds during November. Resultant wind vectors at the meteorological tower during December were 200.7 degrees at 1.6 miles per hour at 8 feet; 200.4 degrees at 2.3 miles per hour at 30 feet; 206.0 degrees at 2.8 miles per hour at 100 feet; and 214.5 degrees at 3.6 miles per hour at 200 feet. The scalar average wind speeds associated with these resultant wind vectors were 3, 5, 6, and 6 miles per hour, respectively. The Ekman spiral and Ekman effect, i.e., a veering in direction and increase in speed as a function of increasing height above the surface, were evident during December. A reference to the December wind roses for the meteorological tower indicates that the winds at that location were primarily south-southwesterly, with a relatively high frequency of occurrence of southerly and southwesterly winds in addition.

The windiest days of the month at the meteorological tower were the 7th, 8th, 9th, 23rd, 27th, and 31st. The days having the lightest winds were the 11th, 12th, 14th, 16th, 17th, 20th, and 22nd. The highest five-minute average wind speed recorded at the tower during December was 40 miles per hour at the 200-foot level on the 16th. On a diurnal basis, the strongest winds at the tower occurred between 1300 and 1600 hours, when vertical mixing and the downward transfer of momentum were maximized. The winds were lightest during the early morning hours, between 0500 and 0900 hours, when the friction layer was stable.

Precipitation totals in the Tract C-b Monitoring Network during December were generally very much below normal. No precipitation was received at the meteorological tower during December. Only 0.01 inch was received at Grand Junction.

The monthly average station pressure at the meteorological tower during December was 790.5 millibars. This reading is 1.4 millibars lower than the November average station pressure of 791.9 millibars. The highest daily average station pressures occurred on the 1st and 2nd. The lowest daily average station pressures occurred on the 9th, 30th and 31st.

Cloudiness decreased slightly in the Tract C-b region during December, compared to the November cloud cover and insolation statistics. The region received an isolated total of 5680.4 langleys, which is equivalent to a daily average insolation total of 183 langleys/day. This average is slightly below the National Weather Service standard for December of 200 langleys/day in the Tract C-b region. On a diurnal basis, the greatest solar radiation rates occurred between 1200 and 1300 hours. The greatest daily radiation totals were received on the 1st and 20th. The lowest daily solar radiation totals were received on the 5th and 6th. The greatest five-minute radiation total received during

December was 4.75 langleys (a rate of 0.95 langleys/minute), which occurred on the 9th and 10th. The largest hourly insolation total received during December was 50 langleys, which occurred on the 9th between 1100 and 1200 hours. Because of the progressively decreasing solar elevations and the increasingly shorter periods of daylight that prevailed during the first two-thirds of December, the total possible solar radiation which could be received during a day decreased monotonically throughout that period. During the last one-third of December, progressively increasing solar elevations provided for increasingly longer periods of daylight. Thus, the total possible solar radiation which could be received during a day increased monotonically throughout the last one-third of December.

The slight decrease in cloudiness and decrease in insolation which affected the Tract C-b during December caused the unstable stability classes to become less common than they had been in November. Using the Pasquill method of stability determination, "C" stability (slightly unstable) was the most common stability, occurring during 166 daytime hours, or 57.2 percent of the time. In decreasing order of frequency, "D" (neutral) stability occurred during 88 hours or 30.3 percent of the time, and "B" (very unstable) stability occurred during 36 hours, or 12.4 percent of the time. "A" (extremely unstable) stability did not occur.

APPENDIX B

TRACT C-b AIR QUALITY DATA

RADIAN
CORPORATION

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                         DIURNAL VARIATION OF NITROGEN OXIDES(UG/M**3)
                          TRAILER NO. - 23  PERIOD(11/ 1/76 TO 11/30/76)

                                             HOUR
          1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24 MEAN
DAY

   1      9         11    *    *    *    *    *    *    *    *    *    *   10   27   12   14   18    9    *    *    *    *    *    7.
   2      *    *    *    *    *    *    *    *   56              9                                  9    *    *    *    *    7.
   3      *    *    *    *    *    *    *    *    *    *   10    *:   *:        13   12   10    *    *    *    *    *    *    *    4.
   4      *   12   15   12    *    *    *    *    *    9    *    9   30   10    *    *    *    *   15    *   28   38   40   47   13.
   5     47   51   34   39   52   52   51   52   53   54   27:   *    *    *    *    *    *    *    *    *    *    *    9    9   24.
   6      *    *    *   15   18   16    9   14   12   14:  12   10    *    *    *    *    *    *    *    *    *    *    9    9    9.
   7      *    *    *   10   10   10    9    *    *    *    *    *   10    *    *    *    *    *:   *:   *    *    *    *    *    6.
   8      *    *    *    *    *    *    *    *    *:  10    9   10   11   15   14   16   12   11   14   12   10    9    9   10    8.
   9      *    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    3.
  10      *    *    *    *    *    *    *    *   16   14   17:   *    *    *    *    *    *    *    *   13   12    9    *    *    7.
  11      *    *    *    *    *    *    *    *    *         *:   *    *    *    *    *    *    *    *    *    *    *    *    *    3.
  12      *    *    *    *    *    *    *    *    *              :    *    :    :    *:   *    *    *    *   10   10   12    *    3.
  13      *    *   11    *    *    *    *    *    *   14   14    :    *:   *   11   10    *    *    *    *    *    *    *    *    6.
  14      *    *    *    *   11   10   11   11    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    6.
  15      9    *   11   13   12    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    4.
  16      *    *    *    *    *    *    *    *    *   12   13    9    *    *    :    *:   *    *    *    *    *    *    *    *    6.
  17      *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    9    *    *   11   10    *   10    *    *    5.
  18      *    *   11   13   20   10    *    *    *    *    *:   *:   *    *    *    *    9   13   13   15   17   13    9    9    9.
  19      *   12   13   14   17   14   14   13   17    :   13:  15   16   17        17   14    *    *    *    *    *    *    *   12.
  20      *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    2.
  21      *    *    *    *    *    *    *    *    *    *    :   10:  12    *   10   10    9    9    9    *    *    *    *    *    4.
  22      *    *    *   12    9    *    *    *    9    *:   *    *    *    *    *    *    *   10   13    9    *    *    *    *    6.
  23      *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  24      *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    3.
  25      *    *    *   10    *    *    *    *    *    *    *    *    *    *    *:  14:  14    9    *    *    *    *    *    *    5.
  26      *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  27      *    *    *    *    *    *    *    *              :    *   12    *    *    *    *    *    *    *    *    *    *   21    1.
  28     39   92   94   93   93   87   70   89   80    *    *:   :    *:   *    *    *                                           58.
  29                                                       :    *:   *    *    *    *    *    *    *    *    *    *    *    *    0.
  30      *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    :    *    *    *    *    *    *    *         1.
MEAN     8.   9.   9.  10.  10.   9.   8.   8.  12.   8.   5.   5.   5.   5.   6.   6.   5.   5.   5.   5.   6.   5.   5.   6.

                    TOTAL NUMBER OF OBSERVATIONS =  7815    MEAN  =       7.

        * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

        : INDICATES CALIBRATION DURING THE HOUR
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RADIAN CORPORATION

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                              DIURNAL VARIATION OF NITRIC OXIDE(UG/M**3)
                            TRAILER NO. - 23  PERIOD(11/ 1/76 TO 11/30/76)

                                                          HOUR
         1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24 MEAN
AY

1        9        11    *    *    *    *    *    *    *    *    *    *   10   27   12   14   18    9    *    *    *    *    *    7.
2        *    *    *    *    *    *    *    *   56              9                                  9    *    *    *    *    7.
3        *    *    *    *    *    *    *    *    *    *   10    *:   *:       13   12   10    *    *    *    *    *    *    *    4.
4        *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
5        *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
6        *    *    *    *    *    *    *    *    *    *:  12   10    *    *    *    *    *    *    *    *    *    *    9    9    4.
7        *    *    *   10   10   10    9    *    *    *    *    *   10    *    *    *    *    *:   *:   *    *    *    *    *    6.
8        *    *    *    *    *    *    *    *    *:   *    9    *    9   11   13   15   10    *    *    *    *    *    *    *    6.
9        *    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    2.
0        *    *    *    *    *    *    *    *   16   14    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    2.
1        *    *    *    *    *    *    *    *    *         *:   *    *    *    *    *    *    *    *    *    *    *    *    *    3.
2        *    *    *    *    *    *    *    *    *               :   *    :    :   *:   *    *    *    *    *    *    *    *    0.
3        *    *    *    *    *    *    *    *    *    *    *     :   *:   *    *    *    *    *    *    *    *    *    *    *    0.
4        *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    1.
5        *    *    9    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    2.
6        *    *    *    *    *    *    *    *    *   12   13    9    *    *     :   *:   *    *    *    *    *    *    *    *    6.
7        *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    2.
8        *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    0.
9        *    *    *    *    *    *    *    *    *     :  13:  15   16   17        17   14    *    *    *    *    *    *    *    6.
0        *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    2.
1        *    *    *    *    *    *    *    *    *    *     :  18:  12    *   10   10    *    *    *    *    *    *    *    *    3.
2        *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    1.
3        *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
4        *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    0.
5        *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:  14:  14    9    *    *    *    *    *    *    2.
6        *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
7        *    *    *    *    *    *    *    *               :   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
8        *    *    *    *    *    *    *    *    *    *    *:    :   *:   *    *    *                                            0.
9                                                     :   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
0        *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     :   *    *    *    *    *    *    *         1.
MEAN     2.   1.   2.   2.   2.   1.   1.   1.   4.   3.   3.   3.   3.   3.   4.   4.   4.   2.   2.   2.   2.   1.   1.   2.

                    TOTAL NUMBER OF OBSERVATIONS =  7815    MEAN  =       2.

       * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

       : INDICATES CALIBRATION DURING THE HOUR
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DIURNAL VARIATION OF NITROGEN DIOXIDE(UG/M**3)
TRAILER NO. - 23 PERIOD(11/ 1/76 TO 11/30/76)

	HOUR																							
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.
2	*	*	*	*	*	*	*	*	*			*								*	*	*	*	*	0.
3	*	*	*	*	*	*	*	*	*	*	*	*:	*:		*	*	*	*	*	*	*	*	*	*	0.
4	*	12	16	12	*	*	*	*	*	9	*	9	34	18	*	*	*	*	15	*	28	38	48	47	13.
5	47	51	34	39	52	52	51	52	53	54	25:	*	*	*	*	*	*	*	*	*	*	*	9	9	24.
6	*	*	*	15	16	15	9	14	12	12:	*	*	*	*	*	*	*	*	*	*	*	*	*	*	5.
7	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*:	*:	*	*	*	*	*	0.
8	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	*	*	18	*	*	*	*	*	2.
9	*	*	*	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	*	*	*	*	*	1.
10	*	*	*	*	*	*	*	*	*	*	10:	*	*	*	*	*	*	*	*	13	12	9	*	*	5.
11	*	*	*	*	*	*	*	*	*		*:	*	*	*	*	*	*	*	*	*	*	*	*	*	3.
12	*	*	*	*	*	*	*	*	*			:	*	:	:	*:	*	*	*	*	10	10	12	*	3.
13	*	*	11	*	*	*	*	*	*	14	14	:	*:	*	11	10	*	*	*	*	*	*	*	*	6.
14	*	*	*	*	11	10	11	11	*	*:	*:	*	*	*	*	*	*	*	*	*	*	*	*	*	5.
15	*	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	*	*	*	*	*	*	*	2.
16	*	*	*	*	*	*	*	*	*	*	*	*	*	*	:	*:	*	*	*	*	*	*	*	*	0.
17	*	*	*	*	*	*	*	*	*	*:	*:	*	*	*	*	9	*	*	11	10	*	10	*	*	4.
18	*	*	11	13	20	10	*	*	*	*	*:	*:	*	*	*	*	9	13	13	15	17	13	9	9	9.
19	*	12	13	14	17	14	14	13	17	:	*:	*	*	*		*	*	*	*	*	*	*	*	*	6.
20	*	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.
21	*	*	*	*	*	*	*	*	*	*	:	*:	*	*	*	*	*	*	*	*	*	*	*	*	1.
22	*	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	13	13	9	*	*	*	*	5.
23	*	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.
24	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	*	3.
25	*	*	*	10	*	*	*	*	*	*	*	*	*	*	*:	*:	*	*	*	*	*	*	*	*	3.
26	*	*	*	*	*	*	*	*	*	*:	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.
27	*	*	*	*	*	*	*	*			:	*	*	*	*	*	*	*	*	*	*	*	*	21	1.
28	63	92	94	93	93	67	92	83	89	*	*:	:	*:	*	*	*									58.
29										:	*:	*	*	*	*	*	*	*	*	*	*	*	*	*	0.
30	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	:	*	*	*	*	*	*	*		0.
MEAN	5.	7.	7.	8.	9.	8.	7.	5.	6.	5.	3.	1.	2.	2.	2.	2.	2.	3.	4.	3.	4.	4.	3.	4.	

TOTAL NUMBER OF OBSERVATIONS = 7815 MEAN = 5.

* DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

: INDICATES CALIBRATION DURING THE HOUR

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                   DIURNAL VARIATION OF SULFUR DIOXIDE(UG/M**3)
                    TRAILER NO. - 23  PERIOD(11/ 1/76 TO 11/30/76)

                                                         HOUR
         1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24   MEAN
DAY

   1     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
   2     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
   3     *    *    *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *     0.
   4     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
   5     *    *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
   6     *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     3.
   7     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *     8.
   8     *    *   13    *   14   13   13    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     5.
   9     *    *    *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *     0.
  10     *    *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  11     *    *    *    *    *    *    *    *    *        *:    *    *    *    *    *    *    *    *    *    *    *    *    *     3.
  12     *    *    *    *    *    *    *    *    *              :    *    :    :   *:    *    *    *    *    *    *    *    *     3.
  13     *    *    *    *    *    *    *    *    *    *    *    :   *:    *    *    *    *    *    *    *    *    *    *    *     0.
  14     *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  15     *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  16     *    *    *    *    *    *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *     0.
  17     *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  18     *    *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *     0.
  19     *    *    *    *    *    *    *    *    *    :   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  20     *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  21     *    *    *    *    *    *    *    *    *    *    :   *:    *    *    *    *    *    *    *    *    *    *    *    *     0.
  22     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  23     *    *    *    *    *    *    *    *    *   *:   16   15   16   15   14   15   15   16   15   16   15   15   15   15     9.
  24    15   16   16   15   16   16   16   15   16   15   16   15   14   13   14   *:    *    *    *    *    *    *    *    *    10.
  25     *    *    *    *    *    *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *     0.
  26     *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  27     *    *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  28     *    *    *    *    *    *    *    *    *    *   *:    :   *:    *    *    *    *    *    *    *    *    *    *    *     1.
  29     *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  30     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    :    *    *    *    *    *    *    *    *     0.
MEAN    1.   1.   1.   1.   2.   1.   1.   1.   1.   1.   2.   2.   2.   2.   2.   1.   1.   1.   1.   1.   1.   1.   1.   1.

                       TOTAL NUMBER OF OBSERVATIONS =  8307    MEAN  =       1.

              * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

              : INDICATES CALIBRATION DURING THE HOUR
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                  DIURNAL VARIATION OF HYDROGEN SULFIDE(UG/M**3)
                   TRAILER NO. - 23  PERIOD(11/ 1/76 TO 11/30/76)

                                                     HOUR
      1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24  MEAN
DAY

  1   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  2   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  3   *    *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *     0.
  4   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  5   *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  6   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *     1.
  7   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *     2.
  8   *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     3.
  9   *    *    *    *    7    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *     3.
 10   *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *     2.
 11   *    *    *    *    7    *    *    7    7         *:   *    *    *    *    *    *    *    *    *    *    *    *    *     3.
 12   *    *    *    *    *    *    *    *    *              :   *     :    :   *:   *    *    *    *    *    *    *    *     1.
 13   *    *    *    *    *    *    *    *    *    *    *     :   *:   *    *    *    *    *    *    *    *    *    *    *     1.
 14   *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 15   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 16   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *     0.
 17   *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 18   *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *     0.
 19   *    *    *    *    *    *    *    *    *     :   *:   *    *    *    *    *    *    *    *    *    *    *    *    *     1.
 20   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 21   *    *    *    *    *    *    *    *    *    *     :   *:   *    *    *    *    *    *    *    *    *    *    *    *     0.
 22   *    *    *    *    *    *    *    *    *   10    7    *    *   10    9    *    *    *    *    *    *    *    *    *     2.
 23   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 24   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *     0.
 25   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *     0.
 26   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 27   *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 28   *    *    *    *    *    *    *    *    *    *    *:    :   *:   *    *    *    *    *    *    *    *    *    *    *     0.
 29   *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 30   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     :   *    *    *    *    *    *    *    *     0.
MEAN  1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   0.   1.   1.   1.   0.   0.   0.    .   0.   1.   1.   1.

                          TOTAL NUMBER OF OBSERVATIONS =  8307     MEAN  =      1.

                 * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

                 : INDICATES CALIBRATION DURING THE HOUR
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RADIAN CORPORATION

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              DIURNAL VARIATION OF TOTAL HYDROCARBONS(UG/M**3 X 10**-1)
                 TRAILER NO. - 23  PERIOD(11/ 1/76 TO 11/30/76)

                                          HOUR
       1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24 MEAN
DAY

  1
  2
  3                                                   :102 105 105 107 107 107 120 114 105 113 119 109  110.
  4  110 114 116 112 110 112 120 120 114 117 114 107 110 116 116 114 111 105 107 111 113 122 113 109  114.
  5  113 113 109 110 114 114 111 115 105 110 112 103 102 109 114 107 107 113 112 110 108 103 107 104  110.
  6  114 113 107 111 107 112 116 113 119 111:123 128 122 123 123 120 119 122 120 125 118 116 119 122  118.
  7  127 127 120 121 120 116 124 118 121 123 133 126 122 129 117 118 119 121:116 117 115 112 117 115  121.
  8  115 129 118 115 120 117 118 125 110:101 104 102 100  98 106 101 108 103 111 108 103 101 105 105  110.
  9  108 112 103 104 106 111 104 105 104 107 105 106:107 105 112 107 106 108 106 111 111 106 106 108  108.
 10  107 104 108 104 108 111 106 111 105 109 102:102 109 104 105 102 103 110 106 108 108 105 106 110  107.
 11  109 110 111 110 109 113 109 111 108     111:117 110 105 104 104 105 105 105 105 105 104 104 104  108.
 12  108 105 106 107 106 110 108 110 109            :121    :   :110:113 110 109 110 108 107 108 107  110.
 13  107 108 109 108 109 106 115 108 110 111 111    :109:109 108 107 107 112 108 110 110 111 113 108  110.
 14  108 107 107 106 106 105 106 105 105 108 105 104 104 103 103 103 104 104 105 105 105 105 110 105  106.
 15  107 113 126 115 114 113 113 120 114 106:111 107 106 106 107 106 105 105 105 105 105 105 107 109  110.
 16  103 103 112 116 124 123 113 119 114 117 112 107 108 108 118:106:105 104 104 104 105 105 105 105  111.
 17  105 105 105 107 105 106 105 105 105 105 103 103 104 105 104 104 103 106 102 103 106 102 102 103  105.
 18  103 105 105 104 103 104 105 106 104 104 104:    :106 102 102 102 102 102 102 103 104 105 104 104  104.
 19  104 106 105 105 109 109 108 107 109 108 105 106 107 108 108 107 107 107 105 105 105 106 109 109  107.
 20  109 109 110 112 112 114 113 111 110 110:105 106 107 108 109 108 108 108 108 114 108 108 109 108  110.
 21  112 111 111 111 110 111 110 111 110 110    : 99:101 104 102 104 104 103 102 103 103 103 103 102  107.
 22  101 103  98 100  99 100         104 101     104  96  98  97  98 107  99 102 103 101 100 102 101  101.
 23  113 107 110 103 102     105 105 103 102  99 102  99  99 100 102 102 102 101 100 100 100 120 101  103.
 24  104 106 100 100 102 102 106 101 100 102 103  98 100 101  99  98 102  99 102  99  98  98  99  98  101.
 25   98  97  97  97  97  99  99  99 101  99 100 100  98  99  98:104:104 105 105 105 105 105 105 105  101.
 26  111 108 106 105 106 107 109 108 108 108 109 107 105 107 107 107 107 107 108 107 107 107 107 108  108.
 27  110 111 114 116 118 121 125 129 132 140    :123 139 147 155 156 167 170 176 176 178 181 183 185  147.
 28  190 191 192 192 193 196 196 195 204 209 214:   :165:179 190 195 198 190 181 177 174 172 170 167  190.
 29  165 164 161 156 155 154 151 148 146 142 135:133 130 125 120 117 114 108 105 108 106 105 104 104  132.
 30  105 104 104 105 109 104 104 104 105 105 105     104 106 103    :105 104 104 116 110 116 106 103  107.
MEAN 114.115.114.114.115.115.116.115.114.116.113.109.111.112.113.113.113.112.113.113.112.112.113.112.

                    TOTAL NUMBER OF OBSERVATIONS =  7453     MEAN  =     113.

           : INDICATES CALIBRATION DURING THE HOUR
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CORPORATION

DIURNAL VARIATION OF METHANE(UG/M**3 X 10**-1)
TRAILER NO. = 23 PERIOD(11/ 1/76 TO 11/30/76)

HOUR

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1																									
2																									
3												:	95	93	94	94	93	94	105	98	94	94	94	93	96.
4	93	93	95	93	93	93	93	93	92	93	94	91	89	89	89	89	89	90	89	89	89	89	89	89	92.
5	94	89	90	89	89	89	89	89	89	89	93	93	89	89	88	90	90	90	90	89	89	89	89	89	90.
6	89	88	89	88	88	88	86	86	90	90:	95	103	97	94	93	93	96	97	94	94	94	95	96	96	93.
7	95	96	95	96	95	95	95	95	95	95	95	96	96	95	95	96	94	94:	94	94	94	93	93	93	95.
8	93	93	94	94	93	94	93	94	94:	93	92	92	92	91	91	90	91	91	93	93	93	92	92	92	93.
9	94	92	92	91	91	91	91	93	91	91	94	91:	93	93	93	93	93	93	93	93	93	93	93	92	93.
10	92	92	92	91	92	91	91	91	91	92	91:	92	94	92	92	91	92	96	94	93	93	92	92	92	93.
11	93	93	96	93	94	94	93	93	94		97:	104	96	93	92	91	92	92	91	90	91	91	91	92	94.
12	92	92	91	92	93	94	94	94	94			:	97	:	:	97:	96	95	95	95	95	94	94	94	95.
13	94	95	94	94	95	94	94	94	95	95	95	:	97:	95	95	95	95	95	96	96	97	95	95	96	96.
14	95	95	95	94	95	93	94	95	94	93	93	93	93	92	92	92	92	94	94	95	94	93	94	94	94.
15	94	[illegible]	103	102	101	100	126	101	101	97:	96	97	95	95	94	94	94	94	94	94	94	94	95	95	97.
16	95	96	99	102	103	103	120	105	102	99	96	96	97	95	95:	95:	96	93	95	94	95	95	95	95	99.
17	95	95	95	94	94	94	94	95	95	94	95	94	94	94	94	93	92	95	93	93	93	92	93	92	94.
18	93	94	93	93	93	93	93	95	93	93	93:	:	97	94	93	93	93	93	92	92	92	92	92	92	94.
19	91	93	93	93	96	95	95	94	95	95	94	95	95	95	95	96	95	95	94	94	94	94	94	95	95.
20	95	95	95	97	96	100	96	97	95	96:	95	96	96	96	95	96	96	95	96	96	95	96	95	96	97.
21	97	97	97	97	97	96	97	95	94	96	:	93:	94	95	94	94	95	94	93	93	93	93	92	92	95.
22	92	92	92	92	92	92			92	92		97	92	91	92	92	90	91	89	90	92	90	93	91	92.
23	96	96	95	95	95		93	93	93	93	91	91	93	93	93	94	94	94	93	93	93	93	92	93	94.
24	92	93	92	92	92	92	94	92	92	92	93	92	93	93	92	92	92	92	91	92	91	92	92	91	93.
25	91	91	92	91	91	92	92	92	92	92	92	91	91	92	91:	96:	96	95	95	96	95	95	95	95	93.
26	[illegible]	96	95	96	96	97	[illegible]	98	98	96	97	97	98	97	98	98	98	98	98	96	98	98	98	98	98.
27	98	99	99	99	99	99	99	103	102	99	:	103	99	98	98	98	97	98	103	99	99	99	99	99	100.
28	[illegible]	103	99	97	97	97	95	97	97	97	97:	:	97:	95	102	97	98	101	97	97	97	97	100	97	99.
29	97	97	97	97	97	97	97	98	97	97	95:	95	95	95	96	95	96	95	96	96	96	95	96	97	97.
30	95	95	96	95	95	95	96	98	95	96	95		95	95	95	:	97	96	96	105	99	100	96	97	97.
MEAN	95.	95.	95.	95.	95.	95.	95.	95.	95.	95.	95.	96.	95.	94.	94.	94.	94.	95.	95.	95.	94.	94.	94.	94.	

TOTAL NUMBER OF OBSERVATIONS = 7453   MEAN = 95.

: INDICATES CALIBRATION DURING THE HOUR

RADIAN
CORPORATION

DIURNAL VARIATION OF NON-METHANE HYDROCARBONS(UG/M**3 X 10**-1)
TRAILER NO. - 23 PERIOD(11/ 1/76 TO 11/30/76)

	HOUR																								
AY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	19	20	21	22	23	24	MEAN
1																									
2																									
3												:	7	10	11	13	13	13	16	16	10	19	25	15	14.
4	18	21	21	19	24	19	27	27	21	24	20	15	20	27	27	24	21	15	17	22	24	34	24	20	23.
5	22	26	19	21	25	25	22	27	16	21	22	13	13	21	26	18	17	23	23	21	19	14	19	15	21.
6	22	24	18	23	19	23	27	25	29	21:	27	25	25	29	30	27	24	25	26	30	23	20	22	26	25.
7	31	31	24	25	25	20	29	22	25	30	35	31	26	33	22	23	25	26:	22	23	21	18	24	21	26.
8	23	35	23	21	26	23	25	32	16:	8	12	10	8	7	14	10	17	12	17	15	11	9	13	14	17.
9	14	20	11	12	15	24	12	12	12	15	15	15:	14	12	19	14	12	15	13	18	17	13	14	15	15.
0	15	11	16	12	16	19	14	19	14	17	10:	10	15	11	13	11	11	14	12	14	14	14	13	17	14.
1	16	17	15	16	15	19	16	17	15		14:	13	14	12	12	12	12	12	14	15	15	13	13	12	15.
2	15	13	15	14	14	16	15	16	16			:	24	:	:	20:	17	14	14	15	13	12	14	13	16.
3	13	13	15	14	14	14	20	14	16	15	15	:	12:	13	13	12	12	16	13	13	13	15	16	13	15.
4	12	11	12	12	11	11	11	11	11	14	12	10	10	10	10	11	11	10	11	10	11	12	16	12	12.
5	12	13	23	12	13	13	12	19	13	11:	14	10	10	11	13	14	11	11	11	11	10	11	12	13	13.
6	12	12	13	14	16	14	13	13	12	17	15	11	11	11	22:	10:	10	9	9	10	10	11	10	10	13.
7	10	10	10	12	11	12	11	10	11	10	7	8	9	11	10	10	10	10	8	9	13	10	9	9	10.
8	10	11	10	10	10	10	11	11	10	11	11:	:	8	8	9	9	9	9	10	10	11	12	11	12	11.
9	11	13	12	12	14	13	13	13	15	14	12	11	11	12	11	10	11	12	11	11	12	12	14	14	13.
0	14	14	14	14	14	14	14	14	13	14:	10	10	11	12	12	12	12	12	12	18	12	13	13	12	13.
1	15	14	13	14	14	14	13	14	16	14	:	6:	7	8	8	9	9	9	9	9	9	10	10	10	12.
2	9	11	5	8	7	6			11	8		6	4	6	5	6	17	9	13	13	10	9	12	10	10.
3	13	11	13	7	7		11	12	10	9	7	10	6	5	6	8	7	8	7	7	7	7	7	9	9.
4	8	13	7	7	9	9	12	9	8	10	7	5	6	8	7	6	11	7	11	7	7	7	7	6	8.
5	7	6	6	6	6	7	7	7	9	7	8	9	7	7	7:	8:	9	10	9	9	9	10	10	10	8.
6	10	10	10	10	10	10	10	10	10	10	11	10	8	10	9	9	9	9	10	9	9	9	9	10	10.
7	11	12	15	16	19	22	27	29	32	40	:	19	40	49	57	69	70	72	75	76	79	81	84	86	47.
8	89	88	93	95	96	98	99	100	107	113	117:	:	68:	83	88	97	100	87	84	79	76	75	70	70	90.
9	66	67	64	61	58	57	54	49	49	45	40:	37	35	30	25	22	18	11	10	12	10	10	9	7	36.
0	9	6	8	8	14	8	8	8	9	10	10		8	10	7	:	8	7	7	11	11	16	10	6	10.
MEAN	20.	20.	19.	19.	20.	21.	21.	21.	20.	21.	18.	14.	16.	18.	19.	19.	19.	18.	18.	19.	18.	18.	19.	18.	

TOTAL NUMBER OF OBSERVATIONS = 7453 MEAN = 19.

: INDICATES CALIBRATION DURING THE HOUR

RADIAN
CORPORATION

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                        DIURNAL VARIATION OF OZONE(UG/M**3)
                      TRAILER NO. - 23  PERIOD(11/ 1/76 TO 11/30/76)

                                         HOUR
        1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24 MEAN
DAY

  1    75  77  76  78  78  76  76  75  70  73  75  76  76  76  77  78  77  74  69  73  76  76  75  76     76
  2    78  77  78  77  79  76  77  76  72  70  75  76  78  77  74  72  69  71  67  72  67  70  71  69     74
  3    72  73  70  71  72  68  66  69  60  69  65  65: 67: 68  70  71  71  68  68  69  70  72  68  69     69
  4    66  63  69  55  70  67  67  64  60  66  70  73  78  80  79  80  76  70  72  72  73  73  74  75     71
  5    77  79  79  78  77  75  76  77  68  72  72: 73  76  79  77  77  78  69  66  65  67  70  72  73     74
  6    71  74  74  74  73  72  70  70  65  67: 64  75  81  79  74  72  70  70  67  62  61  56  62  64     70
  7    65  64  63  63  65  64  63  63  60  61  66  71  76  75  75  76  73  74: 73: 71  72  73  72  71     69
  8    71  71  71  69  69  68  56  66  69: 75  75  76  74  68  67  67  67  66  68  68  73  73  72  72     70
  9    72  72  71  71  72  71  57  65  62  68  75  72: 71  72  71  72  69  64  69  73  74  74  71  71     71
 10    72  72  68  69  71  71  73  73  65  70  73: 73  69  71  74  75  74  71  65  66  67  65  66  67     70
 11    61  60  55  50  50  47  45  47  42      60: 59  63  70  68  67  62  62  59  57  58  57  56  54     57
 12    55  53  53  55  55  54  54  53  57           : 61:   :   : 65: 65  64  63  59  60  60  61  59     58
 13    55  58  57  62  64  62  55  65  66  69  71    :   :                                                64
 14   104 103 102 104 104 102  99  99 103 105: 99: 96 101 105 104  98  97  88  91  88  86  91  85  89     93
 15    92  89  85  79  82  77  79  87  82  97: 98 101 104 106 107 108 103  96  97  99  92  85  94  91     93
 16    94  93  91  86  85  80  73  71  73  83  94 101 102 104 105:109:105 100  97  99  99  99  97 101     93
 17    93  99  97  95  94  95  92  88  80  83: 83: 65  85  83  81  80  78  74  66  68  70  72  70  68     83
 18    68  69  69  70  68  66  52  58  56  66  70: 79: 77  80  77  76  78  70  70  73  70  69  71  72     70
 19    71  67  70  67  69  68  53  64  62    : 74: 70  67  67  65  62  65  69  66  69  74  78  78  80     69
 20    75  75  73  74  78  75  73  75  69  65: 93 114 108 111 113 113 108  99  99 104 107 102 105  95     93
 21    92  93  96  96  98  96 100 101  93  91    : 82: 86  84  86  88  86  81  79  84  86  90  91  80     90
 22    85  85  91  91  91  92  91  98  88  80:100 103 110 112 105  99 102 102  97 101 105 101 105 105     98
 23   105 102  99  95  98  94  94  96  92  84: 83 100 106 106 104 102 102  95  97  96  99  93  96  98     98
 24   102 102 104 102 104 104 107 103  98 101 109 109 108 108 109    :                                 105
 25                                                               : 92: 84  85  87  85  83  82  85  88     86
 26    85  88  86  85  94  77  69  73  80  84: 87  93  91  90  89  88  91  93  91  91  90  89  89  89     87
 27    90  90  93  95  96  97  98  97  98  94  87: 93  96  98  99  98  99  97  95  99  96  97  95  95     96
 28    95  97  97  98  99  97  95  93  85  87  93:   : 65: 62  63  64  63  62  61  62  62  63  65  64     78
 29    64  64  56  55  65  65  64  63  63  64: 69: 78  80  78  80  80  80  81  70  74  73  76  75  74     72
 30    75  74  74  75  76  76  76  76  74  74  83  88  89  88  89    :   : 84: 80  74  76  77  77  75     79
MEAN    79  79  79  78  80  77  76  76  73  78  81  85  84  86  84  83  81  79  77  78  78  79  79  78

                 TOTAL NUMBER OF OBSERVATIONS =  7875     MEAN  =      79.

          : INDICATES CALIBRATION DURING THE HOUR
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                DIURNAL VARIATION OF NITROGEN OXIDES(UG/M**3)
                 TRAILER NO. = 23  PERIOD(12/ 1/76 TO 12/31/76)

                                               HOUR
          1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24  MEAN
DAY

  1                      *:   *    *                        35    :   *:   *    *         *    :    :    :    :    :    *    9     9.
  2      16   12    *    *    *    *    *   *:  23:   15   17    :    :    :    :    :  26:   *    *    *    *    *    *    *     7.
  3       *    *    *    *    *    9   26   25   22   18   19    :    *    *    *    *    *    *    *    *    *    *    *    *     5.
  4       *    *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     2.
  5       *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     2.
  6       *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     1.
  7       *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     1.
  8       *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
  9       *    *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 10       *    *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *     2.
 11       *    *    *    *    *    *    *    *    *    *    *    :    :    :   9:    *    *    *    *    *    *    *    *    *     6.
 12       *    *    *    *    *    *    *    *    *    *    *    *    *    9    *    *    *    *    *    *    *    *    *    *     8.
 13       *    *    *    *    *    *    *    9    *    *    *    *    9    9   10   *:    *    *    *    *    *    *    *    *     5.
 14       *    *    *    *    *    *    *    *    *   *:    :    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 15       *    *    *    *    *    *    *    *    *    :    *    *    *    *    *    *    *    *    *    *    *    *    *    *      .
 16       *    *    *    *    *    *    *    *    *    *   *:    *    *    *   *:                                                   .
 17
 18                                                      :   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 19       *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 20       *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 21       *    *    *    *    *    *    *    *    *    *   *:   *:              *    *    *    *    *    *    *    *    *    *     1.
 22       *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *      .
 23       *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 24       *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 25       *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     2.
 26       *    *    *    *    *    *    *    *    *    *   *:   *:    *    *    *    *    *    *    *    *    *    *    *    *     2.
 27       *    *    *    *    *    *    *    *    *    *    *    *    *    *   *:    :   *:    *    *    *    *    *    *    *     0.
 28       *    *    *    *    *    *    *    *   *:    :    *    *    *   72    :                                               5.
 29                                200       183             *    *    *   *:    :   *:    *    *    *    *    *    *    *    *    26.
 30       *    *    *    *    *    *    *    *    *   *:    *    *    *    *    *    *    *    *    *    *    *    *    *    *     0.
 31       *    *    *    *    *    *   11   12    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     5.
 MEAN    2.   2.   1.   2.   2.   2.  12.   3.   9.   3.   4.   2.   1.   4.   1.   1.   2.   1.   1.   1.   1.   1.   2.   2.

                        TOTAL NUMBER OF OBSERVATIONS =  7662    MEAN  =       3.

         * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

         : INDICATES CALIBRATION DURING THE HOUR
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                        DIURNAL VARIATION OF NITRIC OXIDE(UG/M**3)
                   TRAILER NO. - 23  PERIOD(12/ 1/76 TO 12/31/76)

                                                   HOUR
       1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24 MEAN
DAY

  1                   *:   *    *                        *     :   *:   *    *         *     :    :    :    :    :   *    *    2.
  2    *    *    *    *    *    *    *    *:   *:  10   15     :    :    :    :    :  25:   *    *    *    *    *    *    *    3.
  3    *    *    *    *    *    *    *    *    *    *    *     :   *    *    *    *    *    *    *    *    *    *    *    *    0.
  4    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  5    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    2.
  6    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    1.
  7    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    1.
  8    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  9    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    3.
 10    *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    0.
 11    *    *    *    *    *    *    *    *    *    *    *     :    :    :   *:   *    *    *    *    *    *    *    *    *    3.
 12    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 13    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    2.
 14    *    *    *    *    *    *    *    *    *    *:    :   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 15    *    *    *    *    *    *    *    *    *     :   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 16    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *:                                             0.
 17
 18                                                   :   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 19    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 20    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    4.
 21    *    *    *    *    *    *    *    *    *    *    *:   *:             *    *    *    *    *    *    *    *    *    *    0.
 22    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 23    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 24    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 25    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
 26    *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    0.
 27    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:    :   *:   *    *    *    *    *    *    *    0.
 28    *    *    *    *    *    *    *    *    *:    :   *    *    *    *     :                                             1.
 29                              270       183        *    *    *    *:    :   *:   *    *    *    *    *    *    *    *   26.
 30    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *     .
 31    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
MEAN  0.   0.   2.   0.   1.   0.   3.   0.   7.   1.   1.    .   2.   1.   0.   4.   1.   0.   0.   0.    .   0.   0.   0.

                         TOTAL NUMBER OF OBSERVATIONS =  7562     MEAN  =        1.

               * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

               : INDICATES CALIBRATION DURING THE HOUR
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CORPORATION

                       DIURNAL VARIATION OF NITROGEN DIOXIDE(UG/M**3)
                         TRAILER NO. - 23  PERIOD(12/ 1/76 TO 12/31/76)

                                                        HOUR
       1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24   MEAN
DAY

   1                  *:   *    *                       35    :    *:   *    *         *    :    :    :    :    :    *    9    6.
   2  16   12    *    *    *    *    *    *:  17:   *    *    :    :    :    :    :    *:   *    *    *    *    *    *    *     .
   3   *    *    *    *    *    9   26   25   22   18   19    :    *    *    *    *    *    *    *    *    *    *    *    *    6.
   4   *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
   5   *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *     .
   6   *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
   7   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
   8   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
   9   *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  10   *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    1.
  11   *    *    *    *    *    *    *    *    *    *    *    :    :    :    9:   *    *    *    *    *    *    *    *    *    6.
  12   *    *    *    *    *    *    *    *    *    *    *    *    *    9    *    *    *    *    *    *    *    *    *    *    9.
  13   *    *    *    *    *    *    *    9    *    *    *    *    9    9   10    *:   *    *    *    *    *    *    *    *    5.
  14   *    *    *    *    *    *    *    *    *    *:   :    *    *    *    *    *    *    *    *    *    *    *    *    *     .
  15   *    *    *    *    *    *    *    *    *    :    *    *    *    *    *    *    *    *    *    *    *    *    *    *     .
  16   *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *:                                                 .
  17
  18                                                :    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  19   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  20   *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    4.
  21   *    *    *    *    *    *    *    *    *    *    *:   *:             *    *    *    *    *    *    *    *    *    *    0.
  22   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     .
  23   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *     .
  24   *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  25   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    2.
  26   *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    2.
  27   *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   :    *:   *    *    *    *    *    *    *    0.
  28   *    *    *    *    *    *    *    *    *:   :    *    *    *   64    :                                                 4.
  29                                 *         *         *    *    *    *:   :    *:   *    *    *    *    *    *    *    *    0.
  30   *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    0.
  31   *    *    *    *    *    *   11   12    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    5.
MEAN   2.   2.   1.   2.   2.   2.   2.   3.   2.   2.   4.   1.   1.   3.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.

                          TOTAL NUMBER OF OBSERVATIONS =  7562    MEAN  =       2.

                 * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

                 : INDICATES CALIBRATION DURING THE HOUR
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CORPORATION
                        DIURNAL VARIATION OF SULFUR DIOXIDE(UG/M**3)
                          TRAILER NO, = 23  PERIOD(12/ 1/76 TO 12/31/76)

                                                          HOUR
        1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24 MEAN
DAY

  1     *    *    *    *:   *    *    *    *    *    *    *     :   *:   *    *     :    :    :    :    :    :    :   *    *   0.
  2     *    *    *    *    *    *    *    *:   *:   *    *    *:   *    *:   *    *     :   *:   *    *    *    *    *    *    .
  3     *    *    *    *    *    *    *    *    *    *    *     :   *    *    *    *    *    *    *    *    *    *    *    *   1.
  4     *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *   0.
  5     *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    .
  6     *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *   0.
  7     *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
  8     *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    .
  9     *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 10     *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *   0.
 11     *    *    *    *    *    *    *    *    *    *    *     :   *:   *:   *:   *    *    *    *    *    *    *    *    *   0.
 12     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 13     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *   0.
 14     *    *    *    *    *    *    *    *    *    *:    :   *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 15     *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 16     *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *:   *    *    *    *    *    *    *    *    *   0.
 17     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 18     *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 19     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 20     *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *    .
 21     *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    .
 22     *    *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 23     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 24     *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 25     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 26     *    *    *    *    *    *    *    *    *    *    *:   *:   *    *    *    *    *    *    *    *    *    *    *    *   0.
 27     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 28     *    *    *    *    *    *    *    *    *:    :                  *              *    *    *    *    *    *    *    *   0.
 29     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 30     *    *    *    *    *    *    *    *    *    *:   *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
 31     *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *    *   0.
MEAN   0.    .    .    .   0.    .    .    .    .   0.   1.   0.    .    .    .    .    .   0.    .    .    .    .    .    .

                   TOTAL NUMBER OF OBSERVATIONS =  8539    MEAN  =         .

         * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

         : INDICATES CALIBRATION DURING THE HOUR
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CORPORATION

                     DIURNAL VARIATION OF HYDROGEN SULFIDE(UG/M**3)
                       TRAILER NO. - 23  PERIOD(12/ 1/76 TO 12/31/76)

                                              HOUR
      1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  MEAN
DAY

  1   *   *   *   *:  *   *   *   *   *   *   *   :   :   :   :   :   :   :   :   :   :   *:  :   :      .
  2   :   :   :   :   :   :   :   :   *:  *   *   *   *   *   *   *   *   *   *   *   *   *   *   *     1.
  3   *   *   *   *   *   *   *   *   *   *   *   :   *   *   *   *   *   *   *   *   *   *   *   *     0.
  4   *   *   *   *   *   *   *   *   *   *   *:  *   *   *   *   *   *   *   *   *   *   *   *   *     0.
  5   *   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *   *     0.
  6   *   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *   *      .
  7   *   *   *   *   *   *   *   *   *   *:  *   *   *   *   *   *   *   *   *   *   *   *   *   *     0.
  8   *   *   *   *   *   *   *   *   *   *:  *   *   *   *   *   *   *   *   *   *   *   *   *   *      .
  9   *   *   *   *   *   *   *   *   *   *   *:  *   *   *   *   *   *   *   *   *   *   *   *   *      .
 10   *   *   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *     0.
 11   *   *   *   *   *   *   *   *   *   *   *   :   *:  *:  *:  *   *   *   *   *   *   *   *   *     0.
 12   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 13   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *:  *   *   *   *   *   *   *   *     0.
 14   *   *   *   *   *   *   *   *   *   *:  :   *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 15   *   *   *   *   *   *   *   *   *   *:  *   *   *   *   *   *   *   *   *   *   *   *   *   *      .
 16   *   *   *   *   *   *   *   *   *   *   *:  *   *   *   *:  *   *   *   *   *   *   *   *   *      .
 17   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 18   *   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 19   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 20   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *   *   *      .
 21   *   *   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *      .
 22   *   *   *   *   *   *   *   *   *   *   *:  *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 23   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 24   *   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *   *      .
 25   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *      .
 26   *   *   *   *   *   *   *   *   *   *   *:  *:  *   *   *   *   *   *   *   *   *   *   *   *      .
 27   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *     0.
 28   *   *   *   *   *   *   *   *   *:  :               *           *   *   *   *   *   *   *   *     0.
 29   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   7   9   10  12  10  10    4.
 30   12  10  10  11  10  9   10  12  10  *:  *   *   *   *   *   *   *   *   *   *   *   *   *   *     5.
 31   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *     2.
MEAN  1.  1.  1.  1.  1.  1.  1.  1.  1.  0.  7.  0.  0.   .  0.  0.  0.  0.  0.  0.  1.  1.  1.  1.

                   TOTAL NUMBER OF OBSERVATIONS =  8417    MEAN  =       0.

           * DENOTES A VALID SAMPLE BELOW THE MINIMUM DETECTABLE LIMIT OF THE INSTRUMENT

           : INDICATES CALIBRATION DURING THE HOUR
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[illegible]

              DIURNAL VARIATION OF TOTAL HYDROCARBONS(UG/M**3 X 10**-1)
                  TRAILER NO. = 23  PERIOD(12/ 1/75 TO 12/31/75)

                                                  HOUR
        1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  MEAN
DAY

  1                   :115 108 104 105 111 121 117    :114:108 107 113 111    :   :   :   :106  98  99  110.
  2    101 101 102                    :   :102 105    :   :   :   :   :    274 265                      151.
  3                                                   :
  4                                               :
  5                                           :   :111 105 107 107 104 104                              107.
  6                                           :   :158         221 147 144 144 144 145 144 144 145 144  152.
  7    132 140 142 143 142 142 142 145 148 139:141 141 135 141                                          140.
  8
  9
 10
 11                                            115    :   :   :   :                                     115.
 12
 13                    113 114 114 114                        :   :   :                                 114.
 14                                           :   : 89  91  90  88  86  89  89  89  89  89  88  86  89   89.
 15     89  90  92  90  92  89  88  89  90    :104 108 105 107 106 105 103 101             100      99   96.
 16     99  99      91  94  91  91  95 103 103    :105 110     152:124 105 102 100 104 105 103 100 103  104.
 17    104 105 104 103 103 102          99 100  99 101  97  95  93  93  93  93  97  92  95  97  92  95   96.
 18     89  87  89  88  88  87  88  88  97  90:102: 95  91  91  92  93  94  94  91  91  91  91  91  91   91.
 19     91  91  92  91  91  91  92  92  96 115 102  97  97  95  94  92  92  94 101  93  93  93  92  92   95.
 20     92  93  93  93  93  93  93  92  92: 99: 91  91  93  94  92  93 116  96  91  91  90  99  90  90   94.
 21     90  95 102 109 117 115  95 109 151 208 163 122 101 108 101 102 101 102 102 102 102 102 102 102  112.
 22    103 103 103 102 101 101 101 131 104 102 102 138 156 163 135 103 104 104 105 107 105 104 104 112  112.
 23    103 103 107 104 105 103 103 103 103 103 105 102 100 101 100 103 100 101 102 103 104 106 111 104  104.
 24    104 104 103 103 103 112 100 111 100 109 105 110 103 104 106 102 102 102 101 101 101 102 103 105  105.
 25    105 107 106 103 103  98 103 101 110 104 104 105 104 105 105 104 104 104 104 104 104 104 103 [illegible]  105.
 26    112 103 104 103 103 102 103 102 103 102 102:102: 99  99 102 100 100  99  99  99  99 100 100 104  102.
 27        100      96                     100 100 101 101 102 103 103 101 102 103 104 106 102 103 103  102.
 28    102 102 101 102 102 102 122 102 101 104 105 105 103 102         103 101 102 102 102 101 102 102  103.
 29    101 101 101 101 101 101 121 101 102 102 102 103 107 105 105 105 105 103 103 103 104 103 104 104  [illegible]
 30    104 105 104 104 104 104 104 104 104    :   :   :   :   :   :   :106 105 105 105 105 106 107 106  105.
 31    105 105 110 106 107 109 105 105 109 105 105 105 105 105 107 106 100 110 105 105 106 106 105 106  107.
MEAN   102.102.103.102.104.104.102.104.107.112.112.109.107.106.114.104.104.111.112.103.103.104.102.103.

                  TOTAL NUMBER OF OBSERVATIONS =  5205     MEAN =    105.

           : INDICATES CALIBRATION DURING THE HOUR
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                          DIURNAL VARIATION OF METHANE(UG/M**3 X 10**-1)
                          TRAILER NO. = 23  PERIOD(12/ 1/76 TO 12/31/76)

                                              HOUR
         1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  MEAN
DAY

  1                     : 96  97  97  97  97  98  98    : 98:100  99  98  99    :   :   :   : 94  94  95    98.
  2     94  94  94                        :   : 96  93    :   :   :   :118 114 109 108 102  99  97  96   102.
  3     96  95  95  95  95  94  94  94  94  94  93    : 96  95  95  95  95  95  94  94  94  94  94  94    95.
  4     94  94  94  94  94  94  95  93  95 100  93: 97  95  95  95  95  95  94  94  94  93  93  93  94    95.
  5     94  94  95  97  98 104 102 101 101 101:   :102  97  97  96  96  98                                99.
  6                                           :   :136         118 131 131 132 129 129 129 129 129 130   130.
  7    129 129 129 130 129 129 129 132 129 125:119 119 120 120                                           127.
  8                                        122 120 118 118 127 123 114 113 113 113 112 112 113 113 113   116.
  9    113 112 112 113 113 114 114 114 115 115 115 115 114 113 114 113 114 115 117 113 114 112 113 113   114.
 10    113 116 114 114 113 114 114 115 115 117 118 117 117 116 117 116 119 115 115 115 121 117 115 114   117.
 11    114 114 114 114 114 114 114 114 114 114 115    :   :   :   :118 118 117 116 116 118 117 115 115   116.
 12    114 113 116 116 115 114 114 114 114 113 113 114 114 115 118 117 116 116 116 116 116 115 114 113   115.
 13    113 113 113 113 113 114 114 114 114 113 113 113 113    :   :   :   :                              114.
 14                                           :   : 82  83  81  80  79  79  80  79  79  80  79  79  79    80.
 15     79  80  82  80  80  82  80  79  82    : 91  94  92  93  92  91  90  90              93      90    88.
 16     93  89      89  89  89  89  83  89  92    : 91  91     100: 93  92  90  94  91  92  92  91  91    91.
 17     90  91  91  90  90  90          89  90  90  90  95  95  93  92  92  91  89  89  89  89  88  88    91.
 18     87  87  89  86  86  87  88  88  88  88: 91: 91  91  91  90  93  94  94  91  91  91  91  91  91    90.
 19     91  91  91  91  91  91  92  92  92  95  99  97  95  95  94  92  92  94 101  93  93  93  92  92    94.
 20     92  93  93  93  93  93  93  92  92: 91: 91  91  93  94  92  92  91  91  91  91  90  90  90  90    92.
 21     90  91  92  91  91  91  91  91  91  91  91  75  91  91  92  92  91  91  91  91  91  91  91  91    91.
 22     91  91  91  91  90  90  90  90  90  90  91  91  93  92  92  93  93  92  93  94  93  91  91 101    92.
 23     91  91  91  91  91  91  91  91  91  91  91  90  90  90  90  89  89  89  90  91  91  91  91  92    91.
 24     91  91  91  91  90  90  92  95  94  94  92  92  91  92  93  92  91  91  90  90  90  90  91  93    92.
 25     93  93  94  91  91  90  91  91  91  91  91  91  92  92  92  92  92  93  92  92  92  92  92  92    92.
 26    102  92  92  92  92  92  91  91  91  91  91: 92: 91  91  91  91  90  93  90  89  89  89  89  89    92.
 27         89      89                      89  89  90  90  90  91  91  90  92  92  93  95  91  91  91    91.
 28     91  90  90  90  90  90  90  91  90  91  91  91  91  92          95  93  92  91  91  91  90  91    91.
 29     91  90  91  90  90  90  90  90  90  90  93  94  95  92  91  92  92  91  91  90  90  90  90  90    91.
 30     90  90  93  90  90  90  90  90  90:   :   :   :   :   :   :   : 92  91  91  91  91  91  92  93    91.
 31     92  91  91  91  91  92  91  91  91  92  92  91  92  92  91  91  91  91  91  92  92  91  91  92    92.
MEAN   98. 97. 96. 97. 97. 96. 96. 96. 98. 99.100. 99. 98. 98. 98. 99. 99. 98. 98. 98. 98. 97. 97. 97.

                    TOTAL NUMBER OF OBSERVATIONS =  7323     MEAN  =      98.

           : INDICATES CALIBRATION DURING THE HOUR
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[illegible] CORPORATION

             DIURNAL VARIATION OF NON-METHANE HYDROCARBONS(UG/M**3 X 10**-1)
                    TRAILER NO. - 23  PERIOD(12/ 1/76 TO 12/31/76)

                                                HOUR
        1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24 MEAN
DAY

  1                    :  16   11    7    9   14   23   19      :  15:   8    7   15   12      :    :    :    :  12    5    4  13.
  2     5    5    6                           :    :    6   12      :    :    :    :    :       163  157                        52.
  3                                                                 :
  4                                                            :
  5                                                       :    :    9    8   10    9    5    5                                   8.
  6                                                       :    :   22             103   16   13   14   14   10   15   15   15   13  22.
  7    12   12   12   13   13   12   13   15   11   14:  21   21   14   21                                                        15.
  8
  9
 10
 11                                                            0    :    :    :    :                                             0.
 12
 13                        0    0    0    0                                       :    :    :                                    0.
 14                                                       :    :    7    8    8    8    8    9   10    9    9    9    9    9    9   8.
 15    10    9   10    9   11    8    8    9    9         :  13   13   13   13   14   14   13   12                  10        12  12.
 16     9    9         1    5    3    2   12   14   14         :  14   19        43:  31   13   11   10   13   13   11    9   12  13.
 17    14   15   13   13   13   12                  12   11    9   11    2    2    2    1    1    2    5    3    6    8    4    3   7.
 18     2    0    0    0    0    0    0    0    9   10:  10:   3    1    0    2    0    0    0    2    3    2    1    0    0   2.
 19     0    0    1    0    0    0    0    0    3   21    1    0    2    0    0    0    0    0    0    0    0    0    0    0   2.
 20     0    0    0    0    0    0    0    0    0:   0:   0    0    0    0    4    1   25    5    4    0    0    6    0    0   2.
 21     2    2   10   17   26   24    4   15   60  116   71   47    9   10    9    9   10   10   10   11   11   11   11   11  22.
 22    11   11   11   11   11   11   11   11   14   12   11   45   92   71   43   14   11   12   12   13   12   12   12   12  20.
 23    13   12   15   12   12   12   12   12   12   12   12   12   10   11   12   10   11   11   12   12   13   14   20   12  13.
 24    12   12   12   12   11   22   13   15   15   15   13   18   12   12   13   12   11   11   11   11   11   12   12   11  13.
 25    12   13   12   12   12    8   12   10   18   13   13   13   13   12   13   12   12   10   12   11   12   11   11   11  13.
 26    10   11   12   11   11   11   11   10   11   12   10:   9:   6    6   10    9    9    9    9   10    9   12   11   10  11.
 27         11         7                                12   12   11   11   11   12   12   11   10   11   12   12   11   11   11  11.
 28    11   11   11   11   11   11   11   11   12   13   15   14   13   12                  8    5    9   10   11   11   11   11  12.
 29    11   11   11   11   11   11   11   11   12   12    9   13   12   13   14   13   12   12   12   14   14   13   14   14  13.
 30    14   15   14   13   14   14   14   14   14    :    :    :    :    :    :    :   14   14   14   15   14   14   14   15  15.
 31    14   15   13   14   15   17   15   14   17   15   15   14   14   14   15   14   14   18   14   14   14   14   15   14  15.
MEAN   9.  10.  12.  12.  11.  10.   5.  10.  15.  20.  15.  15.  14.  12.  16.  10.  11.  17.  18.  10.  12.  11.  10.  10.

                    TOTAL NUMBER OF OBSERVATIONS =  5295     MEAN  =      12.

            : INDICATES CALIBRATION DURING THE HOUR
```

DIURNAL VARIATION OF OZONE(UG/M**3)
TRAILER NO. - 23 PERIOD(12/ 1/76 TO 12/31/76)

HOUR

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	92	95	94	92:	92	89	84	87	83	86	87	93:	91:	91	93	92	87	:	:	:	77	77	79	81	84
2	84	81	85	81	81	81	81	83:	62:	72	72	72	71	71	69	74:	59:	68	64	54	45	47	47	49	62
3	51	51	54	50	46	47	45	42	44	42	44	:	69	53	55	55	43	42	43	45	53	55	55	56	51
4	55	57	57	55	56	55	55	53	52	51	63:	60	74	74	77	77	74	71	77	73	71	74	71	68	66
5	55	61	59	54	50	51	47	54	63	62:	45:	45	60	57	64	63	62	64	57	53	57	50	61	51	56
6	62	62	61	61	55	45	46	45	46	57:	75:														56
7										83:	74	65	64	55	65	65	54	63	64	64	65	63	65	65	66
8	54	54	55	65	53	63	64	62	62	64:	63	64	63	52	51	57	59	62	61	59	64	61	62	61	63
9	61	62	59	59	59	59	58	55	58	61	65:	64	65	71	73	74	57	61	51	52	53	53	54	58	61
10	62	62	61	61	58	50	52	58	45	54	44:	59:	63	55	68	69	66	63	62	63	64	63	56	60	60
11	72	71	71	74	72	73	72	73	68	60	63	:	67:	61:	59:	62	62	59	55	56	61	57	61	53	60
12	62	62	65	65	65	65	54	65	64	56	56	63	63	64	64	63	62	56	57	59	63	51	51	65	62
13	65	65	64	65	61	65	57	64	65	67	72	71	69	65	64	75:	76	77	77	79	83	83	84	83	72
14	79	78	78	79	81	82	79	77	73	74:	:	69	71	72	69	67	66	63	61	66	65	65	57	63	72
15	54	63	59	60	61	62	53	61	62	62:	63	72	74	73	74	78	70	71	72	71	74	72	73	74	67
16	73	70	74	74	73	73	71	65	67	67	62:	67	72	75	82:	65	56	63	65	67	55	55	56	66	70
17	65	67	68	67	68	69	69	69	66	62	62	67	63	73	73	72	55	65	69	67	67	59	71	71	66
18	71	72	72	72	71	72	74	75	72	68:	61:	58	68	63	65	61	58	60	62	64	65	57	66	64	63
19	55	55	53	58	57	53	53	62	58	55	57	55	58	51	64	55	58	54	52	61	59	57	59	56	61
20	61	61	60	62	50	59	51	51	56:	57:	54	60	69	73	73	72	59	63	68	63	65	78	73	76	65
21	77	77	77	73	72	72	72	73	68	71	75:	75:	76	77	77	77	73	65	74	72	68	67	68	69	73
22	72	70	65	56	67	69	65	66	67	63	72:	74	75	81	80	76	74	71	67	69	71	73	75	74	72
23	75	75	75	73	75	71	71	72	72	73	75	79	78	77	76	75	74	74	73	72	74	69	67	57	73
24	67	66	68	67	64	65	56	55	59	61:	63:	62	65	67	66	66	68	66	64	64	63	63	54	62	64
25	58	58	59	61	62	62	61	63	62	57	66	69	69	74	70	69	65	63	63	63	63	58	69	55	64
26	63	66	67	66	66	66	56	67	65	63	68:	67:	67	67	65	55	64	63	63	63	52	52	63	63	66
27	63	64	54	63	63	63	54	63	65	65	64	54	70	73	75	70	69	69	66	69	65	57	66	66	67
28	67	57	67	69	69	71	71	71	69:	66:	73	79	77	77			67	66	65	65	55	58	79	71	70
29	69	59	71	71	73	67	70	67	68	66	69	67	66	65	68	67	67	68	65	66	67	57	56	68	68
30	70	59	53	67	60	68	56	66	65	65	66	59	53	55	62	56	59	58	55	57	53	57	58	57	62
31	55	55	57	50	61	52	54	67	65	67	69	70	71	75	75	79	80	79	78	79	79	77	75	75	78
	58	57	57	65	66	65	65	65	64	64	66	68	69	71	71	74	68	55	54	65	65	66	67	67	

TOTAL NUMBER OF OBSERVATIONS = 8387 MEAN = 67.

: INDICATES CALIBRATION DURING THE HOUR

APPENDIX C

TRACT U-a, U-b AIR QUALITY DATA

TOTAL SULFUR
(PPB)

WHITE RIVER SHALE PROJECT, UTAH

SITE A 6

NOVEMBER, 1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 24/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR [LOCAL STANDARD TIME]

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	0	0	0	0	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	0	0
3	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[IN]	0	1	0	0	0	0	0	0	0	0	1
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[IN]	[IN]	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
17	0	0	0	0	0	0	0	0	0	0	[CA]	0	0	0	1	0	1	1	1	0	0	0	0	0	0	1
18	0	0	0	0	0	0	0	0	0	0	0	0	0	[CA]	[CA]	[CA]	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
AV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[ ]
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[ ]

OUTPT [VERSION 4   28 JUL 76]

TOTAL SULFUR
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

DECEMBEP,1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR [LOCAL STANDARD TIME]

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	0	0
14	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	1	1	0	0	0	0	0	0	2
18	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1	1	0	0	0	0	0	0	0	2
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 [	]
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0 [	]

OUTPT [VERSION N 28 JUL 76]

TOTAL HYDROCARBONS
(PPM)

WHITE RIVER SHALE PROJECT, UTAH

SITE A 6

NOVEMBER, 1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR [LOCAL STANDARD TIME]

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	1.5	1.4	1.5	1.5	1.6	1.6	1.6	1.5	1.9	1.9	1.8	1.5	1.5	1.5	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.9
2	1.5	1.5	1.7	1.5	1.6	1.5	1.5	1.5	1.5	1.7	1.6	1.5	1.5	1.7	1.7	1.6	1.7	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.6	1.7
3	1.6	1.7	1.6	1.6	1.6	1.7	1.6	2.0	1.8	2.5	2.2	2.5	2.4	2.5	2.5	2.4	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.8	2.5
4	1.5	1.5	1.5	1.5	1.6	1.5	1.5	1.5	1.6	1.8	1.7	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.6	1.4	1.4	1.5	1.5	1.5	1.5	1.8
5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.5	1.8	1.5	1.5	1.5	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.8
6	1.4	1.4	1.4	1.4	1.3	1.4	1.5	1.5	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.6	1.8
7	1.6	1.6	1.7	1.6	1.6	1.7	1.6	1.6	1.7	1.6	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7
8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.9	2.0	1.8	1.7	1.5	1.5	1.4	1.5	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.6	2.0
9	1.5	1.5	1.6	1.5	1.5	1.6	1.5	1.6	1.7	2.0	1.7	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.5	2.0
10	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.8	1.7	1.6	1.6	1.6	1.5	1.6	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.8
11	1.6	1.5	1.5	1.5	1.5	1.5	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.6	6.9	4.9	1.6	1.7	1.7	1.7	1.7	1.8	1.6	1.6	1.9	6.9
12	1.7	1.6	1.6	1.6	1.6	2.1	1.6	1.7	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.7	1.6	1.6	1.6	2.1
13	1.6	1.6	1.6	1.6	1.7	1.7	1.8	1.7	1.8	1.7	1.7	1.7	1.6	1.6	1.6	8.7	8.3	1.7	1.7	1.7	1.7	1.6	2.2	1.6	2.3	8.7
14	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	2.0	2.3	2.7	2.1	1.5	1.4	1.7	1.6	1.6	1.6	1.7	1.5	1.5	1.5	1.5	1.5	1.7	2.7
15	1.6	1.8	1.6	1.6	1.7	1.7	1.7	1.6	1.6	1.7	1.9	1.5	1.4	1.5	1.5	1.5	1.6	1.6	1.5	1.6	1.6	1.5	1.5	1.5	1.6	1.9
16	1.8	1.5	1.6	1.5	1.8	1.6	1.6	1.6	1.6	1.5	1.5	(CA)	1.4	1.8	1.5	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8
17	1.6	1.6	1.6	1.6	1.7	1.9	1.9	1.8	1.7	1.8	2.3	1.8	1.7	1.7	(CA)	(CA)	(CA)	(CA)	1.6	1.6	1.6	1.6	1.6	1.6	1.7	2.3
18	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.9	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.9
19	1.8	1.8	1.8	1.8	1.8	1.8	1.6	1.7	1.9	2.2	1.8	1.8	1.7	1.6	1.6	1.5	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	2.2
20	1.6	1.6	1.6	1.6	1.7	1.8	1.7	1.7	1.9	2.3	2.3	2.1	1.8	1.6	1.6	1.6	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	2.3
21	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.9	1.6	1.6	1.6	1.6	1.7	1.6	1.7	1.7	1.7	1.7	1.7	1.9
22	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.9	1.9	1.7	1.7	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.9
23	1.7	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	2.0	2.1	1.7	1.7	1.7	1.5	1.7	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	2.1
24	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.8	2.1	1.9	1.7	1.9	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	2.1
25	1.7	1.7	1.7	1.7	1.7	1.8	2.2	2.6	2.3	2.5	2.8	2.5	1.8	1.5	1.5	1.5	1.6	1.5	1.5	1.5	1.6	1.6	1.5	1.6	1.8	2.8
26	1.6	1.6	1.5	1.6	1.6	1.8	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.7	1.6	1.6	1.6	1.7	1.7	1.8	1.7	1.7	1.7	1.6	1.8
27	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.8	1.7	1.8
28	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.8	2.0	2.1	1.9	1.8	1.7	1.7	1.9	1.7	1.6	1.6	1.7	1.6	1.6	1.7	1.7	1.7	1.7	2.1
29	1.7	1.7	1.7	1.7	1.8	1.8	1.7	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.7	1.6	1.6	1.7	1.7	1.6	1.7	1.7	1.7	1.7	1.8
30	1.6	1.7	1.7	1.6	1.7	1.6	1.7	1.8	1.8	1.9	1.8	1.8	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.8	1.8	1.7	1.6	1.7	1.9
31	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
AV	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.9	1.9	1.7	1.7	1.6	1.8	2.0	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	[ ]
SD	.1	.1	.1	.1	.1	.1	.1	.2	.2	.3	.3	.3	.2	.2	1.0	1.4	1.2	.1	.1	.1	.1	.1	.1	.1	.1	[ ]

C-4

OUTPT [VERSION N 28 JUL 76]

TOTAL HYDROCARBONS
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

DECEMBER,1976

AEROVIRONMENT INC.

****
*   *
* PRELIMINARY DATA *
* AS OF 21/JAN/77   *
*   *
****
*   *
*   SUBJECT TO   *
*   REVISION   *
*   *
****

CLOCK HOUR [LOCAL STANDARD TIME]

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.7	1.6	1.6	1.6	1.7	1.6	1.5	1.6	1.6	1.6	1.6	1.7	1.8	1.8	1.6	1.8
2	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.7	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8
3	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.8	1.8	1.7	1.9	1.9	1.8	1.8	1.8	1.7	1.8	1.8	1.9
4	1.9	1.8	1.8	1.8	1.7	1.7	1.8	1.8	1.8	2.0	2.4	1.9	1.7	1.7	1.7	1.8	1.8	1.8	2.0	1.8	1.8	1.8	1.8	1.8	1.8	2.4
5	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.8	1.7	1.8	1.8	1.7	1.7	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.8
6	1.8	1.6	1.6	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.6	1.5	1.5	1.5	1.6	1.5	1.5	1.5	1.7	1.5	1.5	1.5	1.6	1.6	1.8
7	1.5	1.7	1.6	1.6	1.8	1.8	1.6	1.6	1.9	1.9	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.7	1.6	1.7	1.6	1.6	1.5	1.5	1.6	1.9
8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.5	1.6	1.6	1.5	1.8	1.6	1.6	1.5	1.6	1.5	1.5	1.5	1.5	1.8
9	1.5	1.6	1.5	1.5	1.5	1.6	1.5	1.8	1.9	2.2	1.9	1.6	1.6	1.6	1.6	.7	1.7	1.8	1.8	1.8	1.8	1.6	1.5	1.7	1.7	2.2
10	1.6	1.5	1.5	1.5	2.2	1.5	1.5	1.7	1.5	1.5	1.7	1.5	1.7	1.6	1.6	1.6	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	2.2
11	1.6	1.6	1.7	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8
12	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.9	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.7	1.9
13	1.8	1.8	2.0	1.9	1.8	1.8	1.8	1.8	1.8	2.1	2.3	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.8	1.8	1.7	1.8	1.8	2.0	1.8	2.3
14	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.6	2.7	2.2	2.2	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.9	2.7
15	1.7	1.8	1.8	1.8	1.7	1.7	1.7	1.8	1.9	1.9	2.2	1.8	2.0	2.0	1.7	1.7	1.8	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.2
16	1.8	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.3	2.7	2.5	2.1	2.0	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.7
17	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.1	2.3	2.3	2.0	1.9	2.1	1.8	1.8	1.8	1.9	1.9	1.9	2.0	1.9	1.9	1.9	2.0	2.3
18	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	2.0	2.5	2.2	2.0	2.3	1.9	2.0	2.2	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5
19	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.8	2.0	2.1	2.2	1.9	1.8	2.0	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.0	2.0	2.0	2.2
20	1.9	1.9	2.0	1.9	2.0	1.9	1.9	1.9	2.0	1.9	2.2	2.1	1.9	1.9	1.8	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.9	2.2
21	1.8	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.0	2.0	1.8	1.9	1.9	1.8	1.8	1.8	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.9	2.1
22	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.0	2.1	2.2	2.4	2.4	2.0	1.8	1.8	2.0	1.8	1.7	1.7	1.8	1.8	1.8	1.9	1.8	1.9	2.4
23	1.8	1.8	1.8	2.0	1.9	1.9	1.9	2.5	2.3	2.2	1.9	1.8	1.9	1.8	1.8	2.1	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.9	2.5
24	1.7	1.7	1.9	1.8	2.2	2.0	2.5	1.9	2.0	2.1	2.1	1.9	1.9	1.8	1.8	2.0	1.8	1.5	1.6	1.7	1.6	1.6	1.6	1.6	1.8	2.5
25	1.6	1.7	1.7	1.6	1.6	1.6	1.6	1.7	1.9	2.0	1.9	1.8	1.7	1.8	1.7	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.7	1.7	2.0
26	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.8	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.8
27	1.7	1.7	1.7	1.7	1.7	1.6	1.7	1.7	1.7	1.6	1.7	1.8	1.7	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.7	1.8
28	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8	1.9	2.0	1.8	1.7	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.7	2.0
29	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	2.0	2.6	1.9	1.7	[CA]	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.7	2.6
30	1.8	1.8	1.8	1.8	1.8	1.9	1.9	2.1	2.7	2.4	2.6	2.6	2.6	2.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.9	2.7
31	1.7	1.9	1.9	1.9	1.9	2.1	1.8	1.9	1.9	1.9	2.0	1.9	1.8	1.9	1.8	1.8	2.0	1.9	1.8	1.8	2.0	1.9	1.8	1.9	1.9	2.1
AV	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.0	2.0	1.9	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	[ ]
SD	.1	.1	.2	.1	.2	.2	.2	.2	.2	.3	.3	.2	.2	.2	.1	.2	.2	.2	.2	.1	.2	.2	.1	.1	.1	[ ]

OUTPT [VERSION N 28 JUL'76]

METHANE
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

NOVEMBER,1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR (LOCAL STANDARD TIME)

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.6
2	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.5	1.4	1.4	1.5	1.5	1.5
3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.5	1.7	1.6	2.0	1.6	1.5	1.6	1.6	1.4	1.5	1.4	1.5	1.5	1.4	1.5	1.5	1.5	2.0
4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.6
5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.6
6	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.7
7	1.6	1.6	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.8
8	1.5	1.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	1.6	1.6	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.8
9	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.7	1.6	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.5	1.7
10	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6
11	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	3.5	2.2	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	3.5
12	1.7	1.6	1.6	1.7	1.7	1.7	1.6	1.8	1.7	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8
13	1.6	1.6	1.6	1.6	1.7	1.6	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	7.3	6.4	1.6	1.7	1.6	1.6	1.6	1.6	1.6	2.1	7.3
14	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.6	1.7	1.8	1.9	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.9
15	1.5	1.5	1.5	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.7
16	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.5	1.5	(CA)	1.6	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
17	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.6	1.8	1.8	1.7	1.6	1.6	(CA)	(CA)	(CA)	(CA)	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.8
18	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.7
19	1.7	1.8	1.7	1.7	1.7	1.7	1.8	1.7	1.9	1.9	1.8	1.7	1.6	1.6	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.9
20	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8	1.8	1.8	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.8
21	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7
22	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7
23	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.8
24	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.6	1.7	1.7	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8
25	1.7	1.7	1.7	1.6	1.7	1.7	1.9	2.0	1.9	1.9	2.0	1.9	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	2.0
26	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.7
27	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
28	1.7	1.7	1.8	1.7	1.7	1.7	1.8	1.8	1.8	1.9	1.8	1.7	1.6	1.6	1.9	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.7	1.6	1.7	1.9
29	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.7	1.7	1.7	1.7	1.5	1.6	1.6	1.6	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.8
30	1.6	1.7	1.7	1.6	1.6	1.6	1.7	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8
31	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
AV	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.6	1.5	1.6	1.8	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	[ ]
SD	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.4	1.1	.9	.1	.1	.1	.1	.1	.1	.1	.1	[ ]

OUTPT (VERSION N 28 JUL 76)

METHANE
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

DECEMBER,1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR [LOCAL STANDARD TIME]

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.9	1.7	1.6	1.9
2	1.8	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.7	1.8	1.8	1.6	1.6	1.6	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.8
3	1.6	1.7	1.7	1.6	1.7	1.6	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8
4	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	2.0	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.7	2.0
5	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.9	1.6	1.6	1.7	1.7	1.7	1.9
6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.9	1.7	1.9
7	1.6	1.6	1.6	1.7	1.7	1.7	1.6	1.6	1.7	1.8	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8
8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8
9	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.8	1.9	1.8	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.8	1.9	1.8	1.8	1.7	1.7	1.7	1.9
10	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.8
11	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.7	1.7	1.7
12	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.7	1.8
13	2.2	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.0	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	2.2
14	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.9	1.9	1.8	1.8	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.9
15	1.7	1.7	2.0	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.7	1.8	1.7	1.7	2.7	1.8	1.9	1.7	1.7	1.8	1.8	1.8	1.8	1.8	2.7
16	1.8	1.8	1.8	1.9	1.8	1.8	1.8	1.9	2.0	2.1	2.1	1.9	1.8	1.8	1.8	1.9	1.9	1.9	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.1
17	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.9	2.0	2.0	1.8	1.8	2.4	2.4	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.4
18	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.0	2.1	1.8	1.9	2.0	1.8	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.1
19	1.9	1.9	1.8	1.8	1.8	1.9	1.9	1.8	1.8	1.9	1.9	1.9	1.7	1.9	2.0	1.9	2.0	2.0	2.1	2.0	2.0	2.0	1.9	1.9	1.9	2.1
20	1.8	1.8	1.9	1.8	1.8	1.8	1.8	1.8	1.9	1.8	1.9	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.8	1.8	1.8	1.9
21	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.8	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
22	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	1.8	1.8	2.1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	2.1
23	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.0	2.0	1.9	1.8	1.7	2.0	1.7	1.7	1.7	2.3	1.7	2.8	1.7	1.7	1.7	1.7	1.7	1.8	2.8
24	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.8	1.7	1.7	1.7	1.8	1.7	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.9
25	1.7	1.6	1.7	1.7	1.6	1.6	1.8	1.7	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.8
26	1.6	1.9	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.9
27	1.6	1.7	1.6	1.6	1.9	1.6	1.6	1.7	1.6	1.6	1.6	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.9
28	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.8
29	1.7	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	2.0	1.7	1.7	(CA)	1.7	1.7	1.7	1.7	1.7	1.8	1.9	1.8	1.8	1.8	1.7	2.0
30	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9	2.1	2.0	2.1	2.1	2.1	1.9	1.6	1.6	1.6	1.6	1.6	1.8	1.6	1.7	1.7	1.7	1.8	2.1
31	1.8	1.8	1.9	1.9	1.8	1.9	1.8	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.9	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
AV	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	[ ]
SD	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	.1	.2	.1	.1	.1	.1	.1	.1	[ ]

OUTPT [VERSION N 28 JUL 76]

CARBON MONOXIDE
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

NOVEMBER,1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR (LOCAL STANDARD TIME)

DATE	00	01	02	03	04	05,	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	.0	.0	.0	.0	.0	.1	.0	.2	.4	.0	.0	.0	.0	.1	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.4
2	.0	.0	.1	.0	.4	.0	.1	.2	.0	.1	.0	.0	.0	.1	.0	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.4
3	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.1	.1	.2	.0	.3	.1	.0	.0	.0	.0	.1	.3
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.1	.0	.0	.0	.0	.0	.1
5	.0	.1	.0	.0	.0	.0	.1	.0	.0	.1	.1	.1	.1	.2	.4	.0	.1	.0	.1	.0	.0	.0	.1	.0	.1	.4
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.1	.0	.0	.0	.1	.0	.1
7	.0	.0	.0	.0	.0	.6	.0	.4	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.1	.0	.1	.0	.0	.1	.6
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
9	.0	.0	.0	.1	.0	.0	.0	.1	.0	.2	.0	.0	.1	.0	.0	.1	.0	.7	.0	.1	.0	.0	.0	.0	.1	.7
10	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.3	.1	.0	.0	.1	.1	.0	.1	.2	.0	.0	.3
12	.0	.0	.0	.1	.0	.1	.0	.0	.3	.0	.0	.0	.0	.1	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.3
13	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.9	.5	.1	.1	.1	.1	.1	.1	.0	.1	.9
14	.0	.1	.2	.1	.0	.0	.0	.0	.1	.0	.1	.1	.0	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.1	.2
15	.0	.5	.0	.0	.0	.0	.0	.0	.0	.2	.6	.0	.0	1.0	.0	.0	.4	.0	.0	.0	.0	.0	.0	.5	.1	1.0
16	.0	.1	.4	.0	.0	.4	.1	.0	.0	.1	.1	(CA)	.2	.2	.1	.2	.1	.2	.2	.2	.2	.1	.1	.2	.1	.4
17	.1	.1	.1	.1	.1	.1	.2	.1	.1	.2	.2	.1	.1	.1	(CA)	(CA)	(CA)	(CA)	.4	.2	.1	.2	.1	.1	.1	.4
18	.1	.3	.1	.1	.1	.1	.1	.1	.2	.2	.4	.1	.1	.2	.2	.1	.8	.1	.1	.1	.1	.1	.9	.1	.2	.9
19	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.3	.2	.2	.2	.1	.1	.1	.1	.2	.1	.3
20	.1	.1	.1	.1	.1	.3	.1	.1	.1	.2	.1	.2	.1	.1	.2	.1	.1	.1	.1	.2	.1	.1	.1	.2	.1	.3
21	.1	.2	.1	.1	.2	.1	.1	.1	.1	.1	.1	.2	.1	.1	.2	.2	.2	.2	.2	.2	.2	.1	.2	.1	.1	.2
22	.1	.1	.1	.2	.2	.2	.1	.2	.1	.1	.1	.1	.1	.3	.1	.1	.1	.2	.2	.2	.2	.1	.1	.1	.1	.3
23	.2	.1	.1	.1	.2	.1	.1	.1	.1	.1	.2	.2	.1	.2	.1	.1	.2	.2	.2	.2	.3	.1	.1	.1	.1	.3
24	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.1	.2	.2	.1	.2	.5	.1	.1	.1	.1	.5
25	.1	.1	.1	.1	.1	.1	.1	.1	.3	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.3	.1	.3
26	.1	.1	.1	.2	.1	.2	.1	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.1	.2	.2	.2	.1	.2	.2
27	.1	.1	.2	.2	.1	.1	.3	.1	.1	.1	.3	.2	.1	.1	.1	.2	.1	.4	.1	.1	.2	.1	.1	.1	.1	.4
28	.1	.1	.1	.3	.2	.1	.1	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	.2	.2	.2	.1	.3
29	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1	.2	.2	.2	.2	.2	.2	.2	.1	.2
30	.1	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.3	.2	.2	.1	.2	.2	.2	.2	.2	.2	.2	.1	.1	.3
31	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
AV	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	( )
SD	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.2	.2	.1	.1	.1	.1	.1	.2	.1	.1	( )

OUTPT (VERSION N 28 JUL 76)

CARBON MONOXIDE
(PPM)

WHITE RIVER SHALE PROJECT,UTAH
SITE A 6
DECEMBER,1976
AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR (LOCAL STANDARD TIME)

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	.1	.1	.1	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.2	.2	.1	.2	.2	.2	.2	.2	.2	.2	.4	.2	.4
2	.1	.5	.1	.1	.2	.1	.1	.1	.2	.1	.1	.1	.1	.1	.2	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1	.5
3	.2	.1	.2	.2	.1	.2	.1	.3	.1	.1	.1	.1	.1	.1	.1	.2	.1	.2	.2	.2	.2	.1	.2	.2	.2	.3
4	.5	.1	.1	.1	.1	.1	.2	.1	.1	.2	.2	.2	.1	.1	.1	.2	.1	.1	.1	.2	.2	.2	.1	.1	.1	.5
5	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2
6	.6	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1	.1	.4	.4	.1	.1	.1	.2	.1	.2	.1	.1	.2	.2	.2	.6
7	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.3	.1	.1	.1	.1	.1	.1	.3	.2	.1	.2	.2	.2	.1	.3
8	.1	.5	.1	.1	.1	.1	.1	.3	.1	.1	.1	.1	.2	.1	.1	.3	.1	.1	.1	.1	.1	.1	.1	.1	.1	.5
9	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.3	.1	.4	.2	.2	.2	1.0	.1	.1	.2	.2	1.0
10	.4	.1	.1	.2	.2	.2	.2	.1	.2	.1	.1	.1	.4	.1	.1	.2	.2	.2	.2	.2	.1	.2	.1	.1	.2	.4
11	.1	.3	.1	.1	.1	.1	.2	.3	.1	.8	.1	.1	.1	.1	.2	.7	.2	.2	.2	.1	.2	.2	.2	.2	.2	.8
12	.1	.2	.3	.1	.1	.1	.2	.1	.1	.2	.4	.2	.1	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.1	.2	.4
13	.1	.2	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.2	.3	.2	.2	.1	.2	.1	.1	.1	.1	.3
14	.2	.4	.1	.2	.1	.1	.2	.1	.2	.2	.2	.1	.1	.1	.2	.1	.1	.6	.1	.3	.3	.1	.3	.2	.2	.6
15	.2	.1	.2	.3	.1	.1	.2	.1	.1	.1	.1	.1	.1	.1	.4	.1	.2	.2	.2	.2	.2	.1	.2	.3	.2	.4
16	.1	.2	.1	.1	.2	.5	.1	.1	.2	.2	.1	.5	.1	.1	.2	.1	.2	.1	.2	.2	.2	.1	.1	.2	.2	.5
17	.1	.1	.1	.1	.1	.2	.5	.1	.2	.1	.1	.2	.2	.2	.2	.5	.2	.3	.3	.2	.2	.1	.1	.1	.2	.5
18	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1	.7	.2	.2	.2	.2	.1	.2	.2	.1	.2	.2	.7
19	.1	.2	.1	.1	.1	.1	.2	.1	.1	.2	.3	.3	.2	.1	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.3
20	.2	.1	.1	.1	.1	.1	.2	.1	.1	.2	.1	.2	.1	.3	.3	.1	.1	.2	.2	.2	.2	.2	.2	.1	.2	.3
21	.1	.2	.1	.1	.1	.1	.2	.1	.1	.1	.2	.1	.1	.1	.2	.1	.4	.2	.2	.2	.2	.1	.2	.2	.2	.4
22	.2	.1	.1	.2	.2	.1	.1	.2	.2	.2	.2	.2	.1	.1	.1	.4	.2	.1	.2	.2	.2	.2	.4	.2	.2	.4
23	.1	.1	.1	.1	.1	.1	.1	.2	.2	.1	.1	.1	.3	.1	.1	.6	.2	.2	.1	.1	.2	.2	.2	.2	.2	.6
24	.7	.1	.1	.1	.1	.1	.2	.2	.1	.2	.2	.2	.2	.2	.2	.2	.2	.1	.1	.2	.2	.2	.1	.1	.2	.7
25	.2	.2	.1	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.2	1.0	.2	.2	.2	.2	.2	1.0
26	.1	.2	.5	.2	.2	.2	.2	.1	.2	.1	.1	.1	.1	.2	.2	.2	.2	.2	.2	.2	.2	.1	.2	.1	.2	.5
27	.2	.2	.2	.1	.1	.1	.2	.1	.2	.1	.1	.4	.1	.1	.1	.2	.2	.2	.2	.2	.2	.2	.2	.4	.2	.4
28	.2	.2	.2	.2	.2	.2	.5	.2	.2	.1	.2	.1	.2	.4	.2	.2	.2	.4	.9	.1	.2	.2	.2	.1	.2	.9
29	1.0	.1	.1	.1	.1	.1	.2	.1	.1	.2	.2	.2	.1	(CA)	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.2	1.0
30	.2	.1	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.2	.2	.1	.2	.2	.5	.2	.2	.2	.4	.2	.2	.2	.5
31	.2	.2	.2	.2	.2	.2	.4	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.3	.2	.2	.4
AV	.2	.2	.1	.1	.1	.1	.2	.1	.1	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	[ ]
SD	.2	.1	.1	.1	.0	.1	.1	.1	.0	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.2	.1	.1	.1	.0	[ ]

OUTPT (VERSION N 28 JUL 76)

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OXIDES OF NITROGEN
(PPM)
                                                  WHITE RIVER SHALE PROJECT,UTAH       **********************
                                                                                       *                    *
                                                  SITE A  6                            *  PRELIMINARY DATA  *
                                                                                       *  AS OF 21/JAN/77   *
                                                  NOVEMBER,1976                        *                    *
                                                                                       **********************
                                                  AEROVIRONMENT INC.                   *                    *
                                                                                       *     SUBJECT TO     *
                                                                                       *      REVISION      *
                                                                                       *                    *
                                                                                       **********************

                                      CLOCK HOUR  [LOCAL STANDARD TIME]
                                                                                                                    P
   D                                                                                                                E
   A                                                                                                                A
   T   00   01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23  AVE   K
   E

   1 .008 .008 .008 .006 .008 .006 .006 .006 .009 .009 .008 .008 .008 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .008.007 .009
   2 .008 .006 .006 .006 .006 .006 .006 .008 .008 .008 .008 .006 .005 .005 .005 .003 .003 .002 .002 .002 .003 .003 .003 .003.005 .008
   3 .003 .003 .002 .003 .003 .003 .003 .003 .002 [CA] [CA] [CA] [CA] [CA] [CA] [CA] .009 .009 .009 .009 .010 .010 .009 .009.006 .010
   4 .010 .009 .009 .008 .009 .009 .008 .008 .010 .012 .011 .010 .009 .010 .009 .008 .008 .010 .009 .009 .009 .009 .009 .009.009 .012
   5 .009 .008 .008 .008 .008 .008 .008 .008 .008 .009 .009 .009 .008 .008 .010 .008 .008 .008 .008 .009 .009 .008 .008 .008.008 .010
   6 .006 .006 .006 .006 .006 .006 .008 .007 .008 .009 .009 .009 .009 .009 .009 .008 .008 .008 .009 .009 .009 .008 .009 .008.008 .009
   7 .008 .008 .008 .008 .008 .007 .007 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .007 .005 .005 .005 .005.007 .008
   8 .005 .005 .005 .005 .004 .004 .005 .007 .008 .010 .009 .008 .008 .007 .007 .007 .008 .008 .007 .007 .007 .007 .007 .007.007 .010
   9 .007 .006 .004 .004 .004 .004 .004 .004 .005 .006 .006 .005 .004 .006 .006 .007 .006 .006 .007 .007 .007 .007 .007 .006.006 .007
  10 .006 .006 .006 .006 .006 .006 .006 .005 .006 .007 .007 .007 .006 .005 .005 .005 .005 .005 .005 .005 .005 .004 .004 .004.005 .007
  11 .004 .004 .004 .003 .004 .003 .003 .004 .004 .004 .005 .007 .007 .006 .009 .006 .004 .007 .007 .007 .007 .007 .007 .007.005 .009
  12 .007 .007 .005 .004 .004 .003 .003 .003 .003 .003 .003 .004 .003 .003 .003 .005 .006 .005 .005 .004 .004 .004 .004 .004.004 .007
  13 .003 .003 .004 .003 .003 .003 .003 .004 .003 .004 .004 .004 .004 .005 .005 .005 .005 .005 .005 .005 .005 .005 .005 .004.004 .005
  14 .006 .008 .008 .008 .006 .006 .006 .006 .008 .005 .008 .006 .003 .005 .008 .008 .008 .008 .008 .008 .009 .009 .008 .008.007 .009
  15 .008 .008 .008 .006 .006 .006 .006 .006 .006 .008 .009 .008 .006 .006 .006 .006 .006 .006 .005 .006 .006 .006 .006 .006.007 .009
  16 .006 .006 .006 .005 .005 .005 .005 .004 .004 .004 .004 .004 .004 [CA] .003 .003 .004 .004 .004 .004 .004 .003 .003 .003.004 .006
  17 .003 .003 .003 .003 .003 .004 .003 .003 .004 .003 [CA] .003 .005 .007 .009 .003 .005 .009 .008 .008 .008 .007 .007 .008.005 .009
  18 .008 .008 .008 .007 .007 .007 .007 .007 .008 .008 .008 .008 [CA] .008 .008 .008 .007 .008 .007 .007 .007 .007 .007 .007.007 .008
  19 .007 .007 .007 .005 .005 .005 .005 .005 .007 .008 .007 .007 .007 .007 .005 .005 .005 .007 .005 .005 .007 .005 .007 .005.006 .008
  20 .005 .005 .005 .005 .004 .004 .004 .004 .007 .009 .009 .005 .005 .003 .005 .004 .004 .005 .005 .005 .004 .004 .004 .004.005 .009
  21 .004 .003 .003 .004 .003 .003 .003 .003 .003 .004 .004 .004 .003 .000 .000 .005 .004 .004 .004 .004 .004 .004 .004 .004.003 .005
  22 .003 .003 .004 .003 .003 .003 .004 .005 .007 .007 .004 .001 .005 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004.004 .007
  23 .003 .003 .003 .003 .003 .003 .003 .003 .003 .004 .007 .006 .006 .006 .007 .006 .006 .007 .006 .004 .004 .003 .003 .003.004 .007
  24 .003 .003 .001 .001 .001 .001 .003 .001 .001 .004 .004 .003 .006 .004 .004 .004 .004 .003 .003 .004 .003 .003 .003 .003.003 .006
  25 .001 .001 .001 .001 .001 .003 .003 .009 .006 .009 .010 .003 .000 .001 .003 .003 .003 .003 .003 .007 .007 .007 .007 .006.004 .010
  26 .007 .006 .006 .006 .006 .004 .004 .001 .004 .006 .006 .006 .006 .006 .006 .004 .004 .001 .003 .003 .003 .003 .003 .003.004 .007
  27 .003 .003 .003 .003 .003 .003 .001 .001 .003 .003 .003 .003 .003 .004 .003 .003 .003 .003 .003 .001 .001 .001 .003 .003.003 .004
  28 .001 .001 .001 .001 .001 .001 .001 .001 .003 .004 .003 .004 .003 .003 .004 .006 .006 .004 .004 .004 .003 .003 .001 .003.003 .006
  29 .004 .004 .004 .003 .003 .003 .001 .003 .003 .003 .003 .003 .001 .006 .004 .006 .006 .004 .004 .004 .003 .003 .001 .003.003 .006
  30 .003 .003 .001 .001 .003 .001 .001 .001 .001 .003 .004 .007 .006 .004 .006 .004 .006 .006 .011 .012 .011 .011 .009 .006.005 .012
  31 [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ] [  ][  ] [  ]

  AV .005 .005 .005 .004 .005 .004 .004 .005 .005 .006 .006 .006 .005 .005 .006 .005 .006 .006 .006 .006 .006 .006 .005 .005.005 [  ]
  SD .002 .002 .002 .002 .002 .002 .002 .002 .003 .003 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002.002 [  ]

OUTPT  [VERSION N   28 JUL 76]
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OXIDES OF NITROGEN
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

DECEMBER,1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR (LOCAL STANDARD TIME)

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	.004	.003	.003	.003	.003	.003	.004	.003	.004	.004	.006	.006	.007	.009	.007	.007	.006	.006	.006	.004	.004	.004	.006	.009	.005	.009
2	.009	.007	.007	.007	.006	.007	.006	.007	.006	.007	.007	.009	.014	.011	.009	.011	.012	.011	.009	.009	.011	.009	.008	.008	.009	.014
3	.008	.006	.008	.006	.006	.006	.006	.006	.006	.006	.006	.009	.012	.013	.011	.011	.013	.011	.009	.006	.004	.003	.001	.001	.007	.013
4	.003	.003	.003	.003	.001	.001	.001	.001	.001	.003	.003	.003	.001	.008	.011	.009	.009	.009	.009	.009	.009	.009	.009	.008	.005	.011
5	.008	.008	.006	.008	.009	.009	.009	.009	.009	.009	.009	.011	.013	.014	.011	.009	.009	.011	.009	.009	.009	.006	.008	.006	.009	.014
6	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.008	.009	.011	.008	.008	.008	.006	.004	.004	.004	.003	.003	.003	.003	.006	.011
7	.001	.003	.003	.003	.004	.004	.003	.003	.004	.004	.004	.006	.008	.010	.008	.006	.006	.004	.006	.004	.004	.004	.004	.006	.005	.010
8	.006	.006	.006	.004	.004	.004	.004	.003	.003	.004	.006	.008	.010	.013	.010	.010	.011	.010	.008	.008	.004	.004	.001	.001	.006	.013
9	.001	.001	.000	.001	.001	.001	.000	.001	.001	.003	.003	.001	.003	.004	.003	.004	.004	.006	.006	.006	.006	.006	.004	.004	.003	.006
10	.004	.003	.001	.003	.001	.001	.001	.001	.003	.001	.001	.004	.004	.010	.012	.010	.010	.010	.013	.010	.008	.006	.006	.006	.005	.013
11	.006	.006	.006	.006	.006	.004	.006	.008	.008	.008	.010	.012	.015	.017	.021	.021	.015	.014	.014	.012	.010	.008	.008	.008	.010	.021
12	.012	.010	.010	.012	.010	.010	.010	.010	.008	.008	.010	.012	.012	.014	.010	.016	.016	.016	.014	.010	.008	.008	.010	.010	.011	.016
13	.008	.008	.008	.008	.008	.008	.006	.008	.008	.010	.012	.012	.014	.018	.016	.018	.016	.016	.012	.010	.008	.006	.006	.008	.011	.018
14	.008	.006	.006	.006	.008	.008	.006	.006	.004	[CA]	[CA]	[CA]	.016	.016	.008	.010	.014	.012	.010	.006	.006	.006	.006	.004	.009	.016
15	.006	.004	.004	.004	.006	.008	.006	.008	.008	.008	.010	.012	.014	.016	.016	.018	.016	.014	.014	.010	.008	.010	.008	.008	.010	.018
16	.008	.008	.008	.008	.008	.008	.008	.006	.008	.010	.008	.010	.012	.014	.008	.012	.010	.010	.008	.010	.008	.008	.006	.006	.009	.014
17	.006	.006	.004	.006	.004	.004	.004	.004	.004	.004	.006	.008	.014	.012	.014	.016	.016	.014	.012	.010	.003	.008	.006	.008	.008	.016
18	.008	.008	.008	.008	.006	.006	.006	.006	.006	.006	.006	.004	.010	.012	.016	.016	.016	.014	.010	.010	.008	.006	.006	.006	.009	.016
19	.008	.008	.006	.008	.006	.006	.006	.008	.008	.006	.008	.008	.008	.012	.016	.018	.016	.014	.010	.004	.006	.001	.006	.008	.009	.018
20	.008	.008	.008	.008	.008	.008	.008	.006	.008	.008	.010	.008	.010	.014	.016	.014	.012	.012	.010	.008	.008	.006	.008	.006	.009	.016
21	.006	.006	.006	.006	.006	.006	.006	.006	.003	.000	.000	.000	.000	.000	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	.004	.006
22	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[ ]	[ ]
23	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[ ]	[ ]
24	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[OR]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[ ]	[ ]
25	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[ ]	[ ]
26	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[CA]	[CA]	.005	.005	.003	.003	.003	.003	.003	.003	.003	.003	.003	.003	.005
27	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.003	.005	.006	.006	.006	.006	.006	.005	.006	.006	.006	.005	.006	.005	.004	.006
28	.003	.003	.003	.003	.003	.003	.003	.003	.003	.005	.006	.011	.009	.009	.006	.008	.008	.008	.006	.006	.005	.005	.004	.004	.005	.011
29	.004	.004	.004	.004	.002	.004	.002	.004	.004	.004	.006	.005	.006	.006	.011	.009	.008	.006	.007	.005	.004	.004	.004	.004	.005	.011
30	.004	.004	.004	.004	.002	.004	.004	.004	.005	.004	.005	.007	.007	.007	.005	.005	.005	.004	.004	.004	.004	.004	.004	.004	.004	.007
31	.004	.004	.002	.004	.004	.002	.002	.002	.004	.004	.005	.004	.004	.005	.005	.005	.007	.007	.005	.005	.005	.005	.004	.004	.004	.007
AV	.006	.005	.005	.005	.005	.005	.005	.005	.005	.005	.006	.007	.009	.010	.010	.011	.010	.010	.009	.007	.006	.006	.006	.006	.007	[ ]
SD	.003	.002	.002	.002	.003	.003	.003	.003	.002	.003	.003	.003	.004	.004	.004	.005	.004	.004	.003	.003	.002	.002	.002	.002	.002	[ ]

OUTPT (VERSION N 28 JUL 76)

OZONE
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

NOVEMBER,1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR (LOCAL STANDARD TIME)

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	.024	.024	.020	.021	.018	.016	.017	.017	.015	.020	.025	.029	.033	.034	.035	.036	.035	.032	.024	.024	.024	.023	.022	.021	.025	.036
2	.020	.019	.019	.018	.017	.016	.015	.012	.015	.018	.023	.030	.027	.030	.034	.033	.033	.027	.023	.024	.023	.020	.019	.019	.022	.034
3	.018	.019	.018	.017	.015	.013	.013	.011	.012	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	[CA]	.031	.029	.024	.021	.020	.021	.019	.018	.019	.031
4	.019	.017	.016	.014	.012	.012	.011	.010	.012	.014	.019	.025	.029	.030	.032	.032	.032	.029	.022	.020	.020	.021	.019	.019	.020	.032
5	.017	.016	.016	.014	.015	.014	.014	.012	.016	.015	.022	.024	.026	.030	.032	.035	.035	.033	.024	.021	.021	.020	.019	.019	.021	.035
6	.016	.010	.016	.016	.015	.014	.017	.014	.016	.017	.020	.024	.026	.031	.032	.032	.032	.031	.029	.023	.020	.019	.019	.019	.021	.032
7	.019	.018	.018	.017	.016	.015	.014	.013	.014	.018	.020	.023	.028	.029	.031	.033	.033	.030	.022	.022	.019	.020	.019	.019	.021	.033
8	.018	.018	.017	.017	.015	.015	.014	.014	.013	.012	.016	.019	.028	.028	.029	.029	.029	.028	.020	.019	.017	.017	.016	.015	.019	.029
9	.015	.015	.014	.015	.014	.014	.014	.013	.013	.013	.020	.024	.025	.027	.029	.029	.026	.023	.019	.018	.017	.016	.016	.016	.019	.029
10	.016	.015	.015	.014	.013	.013	.012	.011	.014	.014	.019	.021	.023	.026	.027	.023	.021	.020	.017	.016	.015	.015	.015	.016	.017	.027
11	.014	.014	.014	.015	.013	.014	.013	.013	.013	.016	.018	.021	.024	.024	.022	.030	.029	.027	.027	.027	.026	.027	.026	.029	.021	.030
12	.029	.030	.031	.031	.032	.031	.031	.031	.033	.033	.033	.033	.033	.034	.034	.034	.034	.031	.029	.029	.030	.026	.024	.021	.031	.034
13	.022	.021	.020	.019	.018	.017	.014	.014	.015	.020	.023	.026	.025	.026	.026	.032	.032	.029	.028	.031	.032	.030	.030	.031	.024	.032
14	.030	.027	.025	.023	.019	.016	.015	.014	.013	.013	.015	.022	.025	.028	.028	.029	.032	.029	.028	.028	.033	.027	.026	.021	.024	.033
15	.018	.015	.014	.013	.013	.016	.015	.014	.014	.016	.020	.029	.035	.035	.037	.038	.036	.030	.026	.026	.025	.026	.023	.024	.023	.038
16	.023	.022	.022	.022	.020	.018	.018	.017	.020	.020	.028	.033	.034	.036	.035	.035	.035	.030	.026	.025	.024	.023	.022	.021	.025	.036
17	.020	.018	.017	.016	.016	.015	.015	.015	.015	.017	[CA]	.023	.026	.030	.031	.032	.031	.028	.023	.019	.019	.016	.018	.017	.021	.032
18	.016	.016	.017	.016	.015	.015	.015	.014	.015	.017	.018	.023	[CA]	.029	.030	.032	.033	.032	.025	.023	.021	.021	.021	.019	.021	.033
19	.018	.017	.018	.018	.018	.016	.015	.015	.016	.017	.019	.022	.028	.031	.032	.034	.034	.029	.026	.026	.023	.023	.022	.022	.022	.034
20	.022	.021	.020	.021	.021	.019	.019	.020	.018	.021	.021	.020	.024	.031	.037	.039	.037	.034	.026	.024	.023	.024	.023	.024	.025	.039
21	.022	.023	.023	.024	.024	.023	.023	.023	.021	.024	.024	.031	.031	.033	.036	.037	.037	.036	.028	.024	.024	.024	.024	.023	.027	.037
22	.023	.023	.024	.023	.023	.023	.023	.023	.022	.024	.025	.032	.036	.038	.040	.041	.039	.036	.031	.027	.025	.025	.024	.024	.028	.041
23	.025	.026	.025	.026	.027	.025	.025	.024	.023	.023	.023	.029	.033	.034	.037	.038	.037	.034	.028	.025	.024	.025	.024	.024	.028	.038
24	.024	.024	.023	.022	.022	.023	.023	.023	.024	.021	.022	.027	.033	.033	.034	.037	.036	.033	.026	.024	.024	.026	.026	.026	.027	.037
25	.025	.025	.026	.025	.023	.023	.021	.019	.021	.021	.021	.022	.028	.034	.035	.036	.038	.038	.036	.035	.031	.029	.031	.033	.028	.038
26	.035	.036	.040	.039	.039	.033	.029	.031	.033	.035	.034	.035	.033	.033	.032	.033	.034	.035	.034	.034	.033	.032	.032	.032	.034	.040
27	.032	.033	.035	.035	.037	.037	.038	.038	.038	.039	.039	.039	.039	.039	.037	.038	.038	.037	.036	.033	.032	.031	.033	.030	.036	.039
28	.030	.030	.028	.025	.026	.022	.024	.024	.025	.027	.032	.035	.037	.038	.038	.033	.033	.031	.027	.027	.027	.024	.023	.023	.029	.038
29	.026	.025	.025	.023	.024	.023	.023	.023	.023	.027	.027	.032	.033	.022	.027	.033	.033	.031	.027	.027	.028	.024	.023	.023	.026	.033
30	.020	.021	.021	.019	.019	.019	.014	.021	.020	.021	.026	.029	.030	.030	.033	.034	.032	.031	.029	.030	.028	.027	.025	.024	.025	.034
31	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
AV	.022	.021	.021	.021	.020	.019	.019	.018	.019	.020	.023	.027	.030	.031	.032	.034	.033	.031	.026	.025	.024	.023	.023	.022	.024	[ ]
SD	.005	.006	.006	.006	.007	.006	.006	.007	.007	.007	.006	.005	.004	.004	.004	.004	.004	.004	.004	.005	.005	.004	.005	.005	.004	[ ]

OUTPT (VERSION N 28 JUL 76)

OZONE
(PPM)

WHITE RIVER SHALE PROJECT,UTAH

SITE A 6

DECEMBER,1976

AEROVIRONMENT INC.

PRELIMINARY DATA
AS OF 21/JAN/77

SUBJECT TO
REVISION

CLOCK HOUR (LOCAL STANDARD TIME)

DATE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	PEAK
1	.025	.037	.039	.038	.036	.039	.037	.036	.034	.034	.035	.036	.037	.037	.038	.038	.037	.033	.029	.027	.026	.026	.025	.025	.034	.039
2	.024	.024	.024	.023	.023	.023	.022	.022	.023	.023	.026	.029	.031	.032	.034	.035	.034	.034	.027	.025	.025	.024	.023	.022	.026	.035
3	.021	.021	.021	.020	.020	.021	.022	.018	.019	.019	.020	.023	.024	.028	.028	.031	.030	.028	.024	.022	.021	.022	.024	.021	.023	.031
4	.022	.021	.020	.020	.020	.021	.020	.019	.019	.020	.019	.024	.026	.030	.028	.029	.028	.026	.023	.022	.019	.018	.019	.020	.022	.030
5	.020	.021	.021	.022	.023	.022	.025	.027	.021	.023	.025	.029	.032	.032	.033	.036	.036	.035	.037	.036	.035	.033	.031	.029	.029	.037
6	.030	.031	.029	.029	.027	.026	.025	.025	.026	.028	.030	.037	.040	.041	.042	.042	.040	.034	.032	.032	.031	.030	.029	.028	.032	.042
7	.027	.026	.026	.025	.023	.022	.025	.024	.022	.022	.024	.030	.032	.034	.036	.035	.034	.033	.030	.028	.025	.023	.021	.021	.027	.036
8	.021	.020	.019	.017	.018	.019	.018	.017	.017	.019	.021	.026	.026	.029	.033	.035	.035	.029	.025	.024	.026	.025	.024	.024	.024	.035
9	.023	.021	.021	.021	.020	.020	.018	.016	.017	.015	.019	.024	.025	.026	.027	.030	.029	.028	.024	.024	.022	.027	.028	.027	.023	.030
10	.028	.034	.037	.035	.034	.030	.025	.025	.025	.025	.027	.032	.035	.036	.038	.039	.038	.033	.028	.030	.029	.028	.026	.027	.031	.039
11	.026	.025	.024	.024	.023	.023	.021	.021	.020	.024	.027	.033	.034	.034	.038	.038	.037	.031	.027	.027	.028	.026	.026	.024	.028	.038
12	.024	.023	.023	.024	.024	.020	.019	.020	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	.022	.024
13	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	[IM]	.032	.032	.028	.025	.023	.023	.024	.025	.026	.026	.032
14	.026	.023	.026	.026	.029	.029	.028	.027	.032	[CA]	[CA]	.033	.038	.040	.042	.044	.043	.037	.034	.033	.031	.026	.027	.028	.032	.044
15	.029	.029	.030	.029	.028	.027	.028	.027	.027	.026	.033	.038	.044	.045	.046	.045	.043	.036	.035	.036	.035	.036	.037	.035	.034	.046
16	.033	.034	.032	.028	.027	.027	.029	.027	.027	.030	.032	.039	.042	.041	.046	.050	.048	.045	.037	.035	.029	.030	.029	.029	.034	.050
17	.030	.031	.030	.029	.029	.029	.028	.029	.029	.027	.030	.036	.040	.040	.040	.039	.036	.032	.028	.027	.027	.026	.027	.028	.031	.040
18	.028	.028	.028	.027	.028	.027	.028	.028	.028	.028	.029	.033	.035	.035	.035	.039	.040	.034	.031	.031	.031	.031	.031	.031	.031	.040
19	.031	.032	.031	.033	.033	.032	.031	.030	.031	.033	.034	.036	.043	.043	.042	.044	.044	.042	.037	.036	.032	.032	.033	.035	.035	.044
20	.036	.035	.033	.034	.031	.030	.031	.031	.031	.034	.035	.038	.045	.046	.046	.047	.047	.044	.039	.037	.038	.037	.036	.039	.038	.047
21	.039	.036	.035	.034	.035	.035	.036	.035	.037	.038	.040	.045	.048	.050	.052	.054	.052	.051	.049	.042	.039	.040	.039	.036	.042	.054
22	.037	.038	.037	.036	.035	.035	.035	.033	.032	.032	.032	.041	.041	.045	.050	.050	.047	.046	.041	.037	.034	.035	.035	.034	.038	.050
23	.033	.032	.033	.032	.032	.032	.033	.029	.029	.031	.035	.037	.042	.030	.035	.041	.042	.036	.036	.034	.034	.034	.035	.037	.034	.042
24	.037	.037	.037	.037	.037	.035	.038	.031	.030	.032	.037	.041	.047	.051	.052	.050	.047	.049	.043	.043	.038	.038	.039	.041	.040	.052
25	.039	.039	.039	.041	.040	.038	.038	.037	.036	.038	.040	.043	.044	.046	.048	.049	.046	.047	.042	.038	.040	.040	.039	.038	.041	.049
26	.038	.038	.038	.039	.035	.036	.036	.036	.033	.034	.038	.044	.046	.048	.052	.052	.052	.051	.044	.042	.041	.040	.039	.038	.041	.052
27	.035	.038	.038	.039	.039	.039	.041	.043	.041	.042	.043	.047	.055	.060	.060	.060	.060	.055	.059	.062	.058	.054	.056	.054	.049	.062
28	.052	.051	.051	.050	.050	.042	.040	.043	.042	.045	.042	.042	.050	.050	.045	.047	.047	.045	.040	.044	.039	.039	.038	.039	.045	.052
29	.037	.037	.038	.038	.037	.034	.036	.038	.036	.037	.038	.044	.042	.038	.035	.037	.039	.039	.034	.029	.034	.034	.036	.035	.037	.044
30	.033	.034	.033	.033	.027	.031	.031	.029	.024	.029	.029	.032	.031	.035	.041	.043	.043	.044	.043	.043	.042	.036	.034	.031	.035	.044
31	.030	.031	.033	.031	.028	.030	.027	.026	.030	.028	.027	.032	.034	.035	.038	.038	.035	.035	.038	.034	.033	.029	.029	.029	.032	.038
AV	.030	.031	.031	.030	.030	.029	.029	.028	.028	.029	.031	.035	.038	.039	.041	.042	.041	.038	.035	.033	.032	.031	.031	.031	.033	[ ]
SD	.007	.007	.007	.007	.007	.006	.007	.007	.007	.007	.007	.007	.008	.008	.008	.008	.007	.008	.008	.008	.008	.007	.007	.007	.007	[ ]

OUTPT (VERSION N 28 JUL 76)

APPENDIX D

TRACT C-a AIR QUALITY DATA

RIO BLANCO OIL SHALE PROJECT

DAILY AVERAGES

December 1976

Day	SO_2	H_2S	THC	CH_4	NO_x	NO	CO	O_3
1	0.002	0.004	1.586	1.564	0.002	0.004	0.150	0.024
2	0.002	0.004	1.577	1.551	0.002	0.004	0.109	0.025
3	0.002	0.004	1.566	1.542	0.002	0.004	0.100	0.022
4	0.002	0.004	1.567	1.533	0.002	0.004	0.123	0.023
5	0.002	0.004	1.625	1.565	0.002	0.003	0.058	0.024
6	0.002	0.004	1.573	1.521	0.003	0.005	0.101	0.025
7	0.002	0.004	1.487	1.432	0.006	0.007	0.345	0.026
8	0.002	0.003	1.420	1.394	0.007	0.009	0.291	0.023
9	0.001	0.002	1.444	1.398	--	--	0.205	0.026
10	0.001	0.002	1.451	1.412	--	--	0.307	0.029
11	0.001	0.002	1.455	1.433	--	--	0.266	0.026
12	0.001	0.002	1.451	1.439	--	--	0.257	0.025
13	0.001	0.002	--	--	--	--	0.240	0.027
14	0.002	0.002	--	--	--	--	0.241	0.027
15	0.002	0.002	--	--	--	--	0.261	0.028
16	0.002	0.002	1.458	1.434	--	--	0.268	0.026
17	0.002	0.002	1.465	1.436	--	--	0.258	0.025
18	0.002	0.003	1.482	1.455	0.003	0.004	0.235	0.026
19	0.002	0.003	1.491	1.466	0.003	0.003	0.307	0.028
20	0.002	0.003	1.487	1.474	0.004	0.004	0.311	0.026
21	0.002	0.002	1.495	1.416	0.005	0.005	0.234	0.029
22	0.002	0.002	1.505	1.474	0.004	0.005	0.255	0.029
23	0.002	0.002	1.480	1.454	0.005	0.003	0.249	0.032
24	0.002	0.002	1.477	1.444	0.005	0.008	0.220	0.030
25	0.002	0.003	1.519	1.486	0.004	0.000	0.272	0.028
26	0.002	0.003	1.472	1.454	0.004	0.000	0.272	0.026
27	0.002	0.002	1.474	1.446	0.005	0.000	0.196	0.027
28	0.002	0.002	1.495	1.472	0.003	0.000	0.231	0.030
29	0.002	0.003	1.506	1.483	0.003	0.000	0.129	0.026
30	0.002	0.003	1.488	1.460	0.003	0.000	0.121	0.024
31	0.002	0.003	1.492	1.460	0.002	0.000	0.157	0.026
Monthly Average	0.002	0.003	1.500	1.470	0.004	0.003	0.2.8	0.026
Maximum Point	0.004	0.004	1.810	1.667	0.010	0.011	0.681	0.043
Minimum Point	0.001	0.002	1.385	1.361	0.000	0.000	0.000	0.013